

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**  
**Northern and Central California, Nevada, and Utah**  
**Contract No. N62474-94-D-7609 (CLEAN II)**  
**Contract Task Order No. 0108**

**Prepared For**

**DEPARTMENT OF THE NAVY**  
**Dennis Wong, Remedial Project Manager**  
**Engineering Field Activity, West**  
**Naval Facilities Engineering Command**  
**San Bruno, CA 94066-5006**

**NAVAL AIR STATION ALAMEDA**  
**ALAMEDA, CALIFORNIA**  
**GROUNDWATER MONITORING PLAN**  
**FINAL**

**OCTOBER 1997**

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## ACRONYMS AND ABBREVIATIONS

AVGAS	Aviation gasoline
bgs	below ground surface
BSA	Bay Sediment Aquitard
BTEX	benzene, toluene, ethylbenzene and xylene compounds
CLEAN	Comprehensive Long-Term Environmental Action Navy
CTO	Contract Task Order
EFA West	Engineering Field Activity West
FMS	First Merritt Sand
FSP	Field Sampling Plan
FWBZ	First Water Bearing Zone
HSP	Health and Safety Plan
MP	Monitoring Plan
NAS	Naval Air Station
PCB	Polychlorinated biphenyl
PRC	PRC Environmental Management, Inc.
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SWBZ	Second Water Bearing Zone
SVOC	Semi-volatile organic compound
TEPH	Total extractable petroleum hydrocarbons
TOC	Total organic carbon
TPPH	Total purgeable petroleum hydrocarbons
U&A	Uribe and Associates
UST	Underground storage tank
VOC	Volatile organic compound

## 1.0 INTRODUCTION

This Monitoring Plan (MP) provides the rationale for the quarterly groundwater monitoring strategy that will be implemented at Naval Air Station (NAS) Alameda for a period of one year. This monitoring plan does not provide the rationale for long-term monitoring of groundwater at NAS Alameda. A long-term groundwater monitoring plan may be prepared at a later date. The monitoring strategy presented in this MP includes sampling selected groundwater wells during four quarterly monitoring events over the course of one year. Monitoring wells were selected for inclusion in the sampling program by balancing technical considerations, data gaps, the need to protect public health and the environment, and cost-effectiveness.

This MP is Volume I of the Groundwater Monitoring Plan for NAS Alameda and was prepared by PRC Environmental Management, Inc. (PRC) and Uribe and Associates (U&A) under Contract Task Order (CTO) No. 0108 as part of the Comprehensive Long-Term Environmental Action Navy Contract No. N62474-94-D-7609 (CLEAN II). This plan was prepared for the Department of the Navy, Engineering Field Activity West (EFA West), Naval Facilities Engineering Command.

The Groundwater Monitoring Plan consists of Volume I (this MP) and Volume II, a sampling and analysis plan (SAP). The SAP, in turn, consists of: Volume IIa, a Field Sampling Plan (FSP); Volume IIb, a Quality Assurance Plan (QAPP) Addendum; and Volume IIc, a Health and Safety Plan (HSP) Addendum.

### 1.1 PURPOSE

This MP presents the strategy for conducting quarterly assessment of the nature and extent of groundwater contamination at NAS Alameda for a period of one year. The plan identifies the wells to be sampled, the sample analytical parameters, the frequency of sampling, and a base-wide groundwater level measurement approach. The purpose of implementing this plan at NAS Alameda is to:

- Provide additional data to support on-going risk assessment and feasibility study activities
- Monitor seasonal trends in water levels and chemical concentrations in groundwater
- Monitor groundwater movement and assess the potential for contaminant migration through the groundwater
- Provide additional data on background water quality

## 1.2

## SITE LOCATION AND DESCRIPTION

NAS Alameda is located on the east side of San Francisco Bay in Alameda, California (Figure 1-1). The facility occupies the western end of the island of Alameda and was officially closed in May 1997. The eastern part of NAS Alameda is developed with office and industrial buildings, while runways and associated support facilities occupy the western part. Twenty-three potentially contaminated hazardous waste sites have been identified at NAS Alameda during the remedial investigation (RI). Figure 1-2 shows these sites (with the exception of Site 18, the facility-wide storm water system).

## 1.3

## HYDROSTRATIGRAPHY

Groundwater monitoring wells are installed in four hydrostratigraphic units underlying NAS Alameda; the first water-bearing zone (FWBZ); the Bay Sediment Aquitard (BSA); the second water-bearing zone (SWBZ); and the First Merritt Sand (FMS). The monitoring wells in each water-bearing zone are screened in either the upper or lower portion of the zone; the zones are designated with a "U" for the upper or an "L" for the lower portion of the zone. Groundwater monitoring wells that will be sampled during the quarterly monitoring events are shown on Figure 1-3, which also identifies the unit in which each well is screened.

The FWBZ occurs in the artificial fill, which consists of dredge spoils from San Francisco Bay, the Seaplane Lagoon, and the Oakland Inner Harbor. Much of NAS Alameda is built on this fill material which was deposited hydraulically in the late 1930s and early 1940s. First-encountered groundwater in this zone occurs at approximately 5 feet below ground surface (bgs), but is variable. The FWBZ is approximately 20 to 40 feet thick and consists of dredge spoils of silty sand to sand with minor inclusions of clay and/or gravel (PRC 1993a).

The BSA underlies the FWBZ in most parts of NAS Alameda. The bay sediments are clay to silty clay with sand interbeds. This is the youngest naturally-occurring unit at NAS Alameda. This unit varies from 0 feet (absent) to approximately 30 feet thick (PRC 1993a).

The SWBZ occurs in the terrestrial and estuarine deposits that underlie the BSA. The lower part of the unit, mostly terrestrial deposits, makes up the water-bearing zone. The depth to the SWBZ is about 40 to 70 feet bgs, the thickness of the zone is approximately 30 feet, and the lithology consists of sand and

gravel channels, with silt and clay interbeds (PRC 1993a). The Hydrostratigraphic units for two areas of NAS Alameda (the western and central region and the southeastern region) and the corresponding lithostratigraphic unit for each are summarized in Figure 1-4.

The FMS occurs in eolian deposits underlying the BSA where it exists (PRC 1993a). This unit consists of a fine-grained sand to silty sand and is up to 60 feet thick.

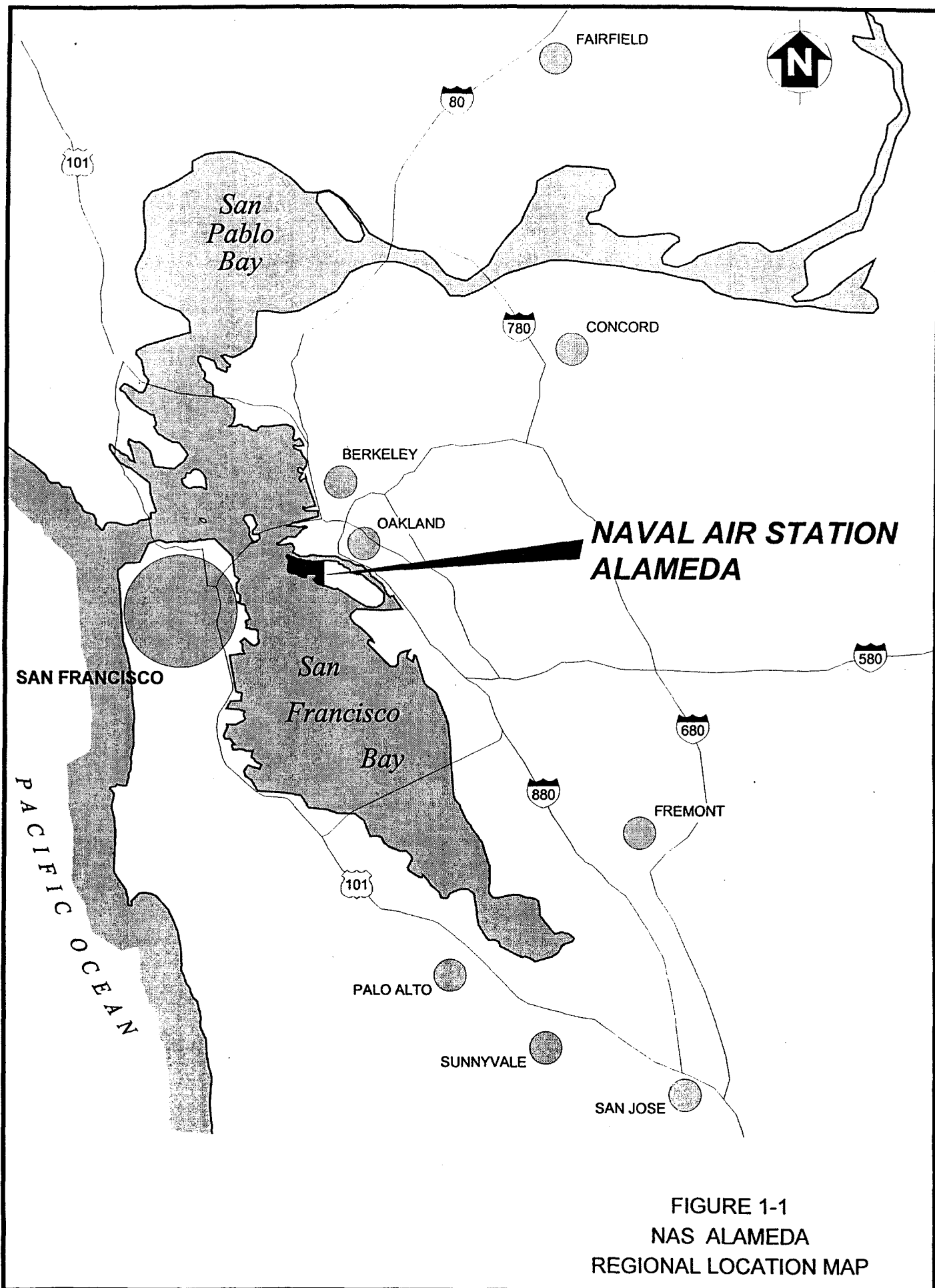


FIGURE 1-1  
NAS ALAMEDA  
REGIONAL LOCATION MAP



**LEGEND**

- INSTALLATION RESTORATION SITES
- APPROXIMATE WETLANDS AREAS
- ESTIMATED GROUNDWATER FLOW FIRST WATER BEARING ZONE
- ESTIMATED GROUNDWATER FLOW SECOND WATER BEARING ZONE

NOTE: GENERAL GROUNDWATER FLOW DIRECTIONS BASED ON MAY 2, 1997 GROUNDWATER ELEVATION MEASUREMENTS

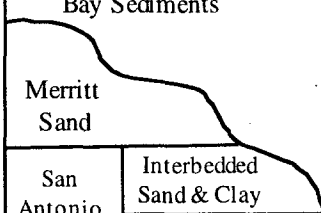
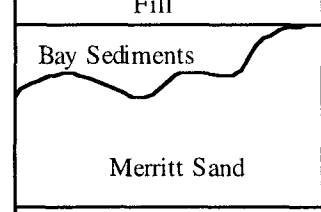


600 0 600 1200  
SCALE: 1" = 1200'

**FIGURE 1-2**  
**NAS ALAMEDA**  
**ALAMEDA, CALIFORNIA**  
**INSTALLATION RESTORATION SITES**  
**AND GROUNDWATER FLOW DIRECTIONS**



**FIGURE 1-4**  
**NAVAL AIR STATION ALAMEDA**  
**HYDROSTRATIGRAPHIC UNITS**

Western/Central Regions			Southeastern Region	
Lithostratigraphic Unit		Hydrostratigraphic Unit	Lithostratigraphic Unit	Hydrostratigraphic Unit
Fill		 First Water-Bearing Zone	Fill	 Shallow Water-Bearing Zone
Bay Sediments			Bay Sediments	
Merritt Sand			Merritt Sand	
San Antonio Formation	Interbedded Sand & Clay		Interbedded Sand & Clay	
	Yerba Buena Mud	Yerba Buena Mud Aquitard	Yerba Buena Mud	Yerba Buena Mud Aquitard

## 2.0 GROUNDWATER SAMPLING AND ANALYSIS

Up to one hundred wells will be sampled during the NAS Alameda groundwater monitoring program including 91 on-base monitoring wells and potentially nine off-base water wells. The following subsections will provide the site by site rationale for the selection of wells to sample and the analytical parameters for each. Groundwater data for specific sites are summarized from the results appearing in the following reports:

- Final Submittal, Sanitary Landfill Site Study, Naval Air Station, Alameda, California (Harding Lawson Associates [HLA] 1978)
- Confirmation Study, Sanitary Landfill, Naval Air Station Alameda, California (HLA 1983)
- Site Investigation, NAS Naval Exchange Gas Station, Alameda, California (Environmental Resource Management-West [ERM-West] 1987)
- NAS Alameda, Alameda, California. Data Summary Report RI/FS Phases 2B and 3, Final (PRC and JMM 1992)
- NAS Alameda, Alameda, California. Data Summary Report Background and Tidal Influence Studies and Additional Work at Sites 4 and 5, Final (PRC and James M. Montgomery, Consulting Engineers, Inc. [JMM] 1995)
- NAS Alameda, Alameda, California. Solid Waste Water Quality Assessment Test (SWAT) and Data Summary Report RI/FS Phases 5 and 6, Final (PRC and Montgomery Watson 1993a)
- NAS Alameda, Alameda, California. Data Summary Report RI/FS Phases 1 and 2A, Final (PRC and Montgomery Watson 1993b)
- Remedial Investigation/Feasibility Study, Data Transmittal Memorandum, Sites 4, 5, 8, 10, 12, and 14, Final. Naval Air Station, Alameda, California (PRC and Montgomery Watson 1996)

The direction of groundwater flow is useful in predicting the movement of contaminant plumes and was considered as part of the rationale for selecting quarterly sampling wells at each site. Figure 1-2 shows the direction of groundwater flow based on groundwater measurements conducted on May 2, 1997.

### 2.1 SITE 1 - 1943-1956 DISPOSAL AREA

The Site 1 Disposal Area is located in the northwestern portion of NAS Alameda (Figure 1-2). Waste disposal operations at the site began in the early 1940s and continued through 1956, largely in the northern half of the site. Materials reported to have been disposed of at the site include aircraft engines,

garbage, scrap metal, waste oil, paints, solvents, cleaning compounds, construction debris, and low-level radioactive material. Waste disposal at the site was discontinued by 1956 after runway 13-31 was extended over the northern portion of the Disposal Area. A pistol range was also present in the western portion of the site (PRC 1993c).

Currently, there are 40 active groundwater monitoring wells associated with Site 1. Prior sampling of these wells has detected volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), petroleum hydrocarbons, and metals in groundwater at the site.

### **2.1.1 Proposed Sampling Plan**

Table 2-1 lists the 13 groundwater wells that will be sampled at Site 1, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

### **2.1.2 Sampling Plan Rationale**

Samples from each of the 13 wells being monitored at Site 1 will be analyzed for VOCs on a quarterly basis. VOC data will be collected from 11 wells in the FWBZ. Data from six of these wells will be used to monitor water quality associated with a solvent plume in groundwater located in the southern portion of the site. Wells M027-E, M031-E, and M033-A are located near the edges of the plume. VOC data from wells M028-A, M028-E, and M034-A will be used to evaluate water quality within the plume. Data from well M028-C, in the SWBZ, will be used to monitor the potential vertical migration of VOCs.

Samples from wells M001-E, M028-A, M028-E, M029-E, and M034-A, located in the northwestern portion of the site and screened in the FWBZ, will be analyzed for SVOCs each quarter. These wells were selected for SVOC analysis because (1) SVOCs have been detected previously in some of these wells and (2) to evaluate the possible enhanced migration of SVOCs in the area of the solvent plume. Samples from well M002-E, screened in the upper portion of the BSA, will also be analyzed quarterly for SVOCs; SVOCs were detected here previously and the highest concentrations of SVOCs are typically found at the top of the BSA.

Samples from each of the 13 wells being monitored at Site 1 will be analyzed for metals and general water quality parameters (anions, sulfide, alkalinity, and nitrate as nitrate/nitrite as nitrogen) on a quarterly basis. The data from these analyses will provide information for (1) assessing potential impacts to groundwater from the Disposal Area, (2) a base-wide analysis of ambient water quality, and (3) an evaluation of the beneficial uses of groundwater at NAS Alameda. Metals data for samples collected from well M035-A, located adjacent to the pistol range, will also be used to evaluate the potential impacts to the groundwater from activities at the pistol range.

Samples from wells M028-A, M028-C, M028-E, and M034-A will be analyzed quarterly for total purgeable petroleum hydrocarbons (TPPH) and total extractable petroleum hydrocarbons (TEPH); petroleum hydrocarbons have been previously detected in these wells. Samples from these wells will be analyzed for total organic carbon (TOC) during the first quarterly sampling event. TOC is a necessary co-metabolite in biodegradation. The TOC data from this groundwater sampling investigation will be used to help evaluate the biodegradation potential for the petroleum hydrocarbons and solvents in the groundwater at Site 1; a high TOC concentration indicates a high potential for biodegradation.

## **2.2 SITE 2 - WEST BEACH LANDFILL**

Site 2, the West Beach Landfill, is located in the southwestern portion of NAS Alameda (Figure 1-2). Waste disposal operations at the site began in approximately 1952 and continued through 1978. Materials reported to have been disposed of at the site include municipal garbage; solvents; oily waste and sludges; paint wastes, strippers, thinners, and plating wastes; industrial strippers and cleaners; acids; mercury; fluids and rags contaminated with polychlorinated biphenyl (PCB); batteries; low-level radioactive material; scrap metal; inert ordnance; asbestos; pesticides; tear gas agent; infectious waste; creosote; and waste medicines and reagents (PRC 1993c). A wetland area is located adjacent to the site to the southwest.

Currently, there are 44 active groundwater monitoring wells associated with Site 2. Prior sampling of these wells has detected VOCs, SVOCs, pesticides/PCBs, and metals in groundwater at the site. This site is a wetland area with a protected nesting area for the Least Tern, and endangered species. Access restrictions exist in the nesting areas at Site 2 during May through September and may limit the ability of the sampling team to collect groundwater samples during these months.

### **2.2.1 Proposed Sampling Plan**

Table 2-2 lists the 20 groundwater wells that will be sampled at Site 2, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

### **2.2.2 Sampling Plan Rationale**

The 20 monitoring wells selected for the quarterly sampling program monitor three areas. The area between the site and the adjacent wetland is monitored by the following wells: M036-A, -B, and -E; M037-A, -B, and -E; M038-A, -B, and -E; and M039-A, -B, and -E. These wells are screened in either the FWBZ, the BSA, or the SWBZ; data from these wells will be used to assess both the horizontal and vertical distribution of contaminants in groundwater at Site 2. The remaining perimeter of the site is monitored by wells M010-A, M013-A, M023-E, and M024-A and -E, screened in the FWBZ. Wells M017-A, M019-E, and M021-E, also screened in the FWBZ, monitor the area between the wetland and San Francisco Bay. In addition to monitoring plume migration at the site, data from these wells will be used to conduct a feasibility study and perform an ecological risk assessment at NAS Alameda.

Samples from each of the 20 wells being monitored at Site 2 will be analyzed for VOCs on a quarterly basis to evaluate the migration of VOCs previously detected in groundwater at the site.

Samples from 11 wells in the FWBZ will be analyzed for SVOCs, which have been previously detected at the site. These analyses will be conducted quarterly on samples from wells M019-E and M023-E. Samples from the remaining nine wells will be analyzed for SVOCs every other quarter. Samples from wells screened in the upper portion of the FWBZ will be analyzed for SVOCs during the first and third sampling event. Samples from well M024-E, screened in the lower portion of the FWBZ, will be analyzed for SVOCs during the second and fourth sampling event.

Samples from four wells screened in the FWBZ (M036-A, M037-A, M038-A, and M039-A) and located between the landfill and wetland area will be analyzed for pesticides/PCBs on a quarterly basis; these analytes have been detected intermittently at the site.

Samples from each of the 20 wells being monitored at Site 2 will be analyzed for metals and general water quality parameters on a quarterly basis. The data from these analyses will provide information for (1) assessing potential impacts to groundwater from the landfill, (2) a base-wide analysis of ambient water quality, and (3) an evaluation of the beneficial uses of groundwater at NAS Alameda.

### **2.3 SITE 3 - AREA 97, ABANDONED FUEL STORAGE**

Site 3, an abandoned fuel storage area, is located in the east-central portion of NAS Alameda, approximately 200 feet west of the East Gate (Figure 1-2). The site previously contained five partially buried storage tanks. Between 1975 and 1978, four of these five tanks were found to be leaking. Subsequently, all five tanks were reportedly cleaned, destroyed, and buried in place. Approximately 365,000 gallons of aviation gasoline (AVGAS) may have leaked from the tanks before they were closed (PRC 1993c).

Currently, there are 10 active groundwater monitoring wells at Site 3. Prior sampling of these wells has detected petroleum hydrocarbons (including VOCs) associated with the AVGAS releases, and VOCs suspected to be originating from nearby Site 14. In addition, there may be other sources of VOC contamination.

#### **2.3.1 Proposed Sampling Plan**

Table 2-3 lists the three groundwater wells that will be sampled at Site 3, identifies the parameters for which these samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

#### **2.3.2 Sampling Plan Rationale**

The three wells to be sampled at Site 3 are screened in the FWBZ. Well M03-07 is located along the margin of the petroleum hydrocarbon plume originating at Site 3. This plume is migrating radially from the center of the site under the influence of recharge from on-site landscape irrigation. Samples from this well will monitor plume migration. Petroleum hydrocarbons detected in well M03-04 may not be originating from Site 3; data from the quarterly sampling will be used to further assess the source of the hydrocarbons detected in samples from this well.

Samples from well M03-04 and M03-07 will be analyzed quarterly for VOCs to monitor the migration of the petroleum hydrocarbon plume. Samples from well M03-05 will also be analyzed quarterly for VOCs to assess the migration of VOCs originating at both Site 3 and nearby Sites 4 and 11 (see Sections 2.4 and 2.9, respectively).

Samples from the three wells being monitored at Site 3 will be analyzed for metals and general water quality parameters on a quarterly basis. The data from these analyses will provide information for (1) assessing potential impacts to groundwater from the fuel storage area, (2) a base-wide analysis of ambient water quality, and (3) an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from wells M03-04 and M03-07 will be analyzed quarterly for TPPH and TEPH to monitor plume migration.

Samples from these three wells at Site 3 will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the petroleum hydrocarbons and solvents; a high TOC concentration indicates a high biodegradation potential.

## **2.4 SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY**

Site 4, an aircraft engine facility, is located in the east-central portion of NAS Alameda, near the eastern perimeter of the base (Figure 1-2). The site consists of Building 360, an aircraft engine repair facility that began operation in 1954. Activities in the building have included metal machining and plating, painting, and parts cleaning (PRC 1993c).

Currently, there are 10 active groundwater monitoring wells at Site 4. Prior sampling of these wells has detected VOCs and metals associated with past operations at Building 360.

### **2.4.1 Proposed Sampling Plan**

Table 2-4 lists the nine groundwater wells that will be sampled at Site 4, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

#### **2.4.2 Sampling Plan Rationale**

The nine wells to be sampled at Site 4 are screened in the FWBZ. Samples from these wells will be collected and analyzed for VOCs each quarter. VOC data will be used to monitor the extent of the solvent plume in groundwater, located primarily in the central and northwestern portions of the site. Data from wells D04-02, MW360-2, MW360-3, and MW360-4 will monitor the margin of the plume. Data from well M04-07 will be used to evaluate the relationship between solvent plumes originating at Sites 4, 11, and 21; Sites 11 and 21 are discussed in Section 2.9 of this MP.

Samples from each of these wells will also be analyzed quarterly for metals and general water quality parameters. Metals data will be used to evaluate the extent of contaminant and ambient metals concentrations at NAS Alameda. General water quality parameters data will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from each of the nine wells will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents found at Site 4; a high TOC concentration indicates a high biodegradation potential.

#### **2.5 SITE 5 - BUILDING 5, AIRCRAFT REWORK AREA**

Site 5 is located in the central portion of NAS Alameda (Figure 1-2). The site consists of Building 5, an aircraft rework facility that began operation in 1942. Activities in the building have included metal machining, cleaning, and reworking; plating and painting. Two 18-foot deep sumps in the building were used to collect wastewater from plating operations (PRC 1993c).

Currently, there are 17 active groundwater monitoring wells at Site 5. Prior sampling of these wells has detected VOCs, metals, and cyanide associated with past operations at Building 5.

### **2.5.1 Proposed Sampling Plan**

Table 2-5 lists the 16 groundwater wells that will be sampled at Site 5 (including one well [M10-01] installed during investigations at Site 10), identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

### **2.5.2 Sampling Plan Rationale**

Fifteen of the 16 wells to be sampled at Site 5 are screened in the FWBZ (Table 2-5). The remaining well, D05-02, is screened in the SWBZ. Samples from each of the 16 wells will be collected and analyzed for VOCs each quarter. VOC data will be used to monitor the extent of the VOC plume in groundwater, originating under Building 5. Data from a well associated with Site 12, M12-01 (see Section 2.12), will also be used to monitor the VOC plume.

Samples from each of these wells will also be analyzed quarterly for metals and general water quality parameters. Metals data will be used primarily to evaluate the extent of contaminants at Site 5. Data will also be used to evaluate background metals concentrations. General water quality parameters data will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from each of the 16 wells will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents found at Site 5; a high TOC concentration indicates a high biodegradation potential.

## **2.6 SITE 6 - BUILDING 41, AIRCRAFT INTERMEDIATE MAINTENANCE FACILITY**

Site 6 is located near the northeast corner of the Seaplane Lagoon (Figure 1-2). The site consists of Building 41, a former aircraft repair facility. Various halogenated and non-halogenated solvents, paints, strippers, hydraulic fluids, and their associated wastes were used and/or stored in the building. An aboveground solvent tank was present west of the building (PRC 1993c) and was removed sometime between 1988 and 1991.

Currently, there are six active groundwater monitoring wells at Site 6. Prior sampling of these wells has detected VOCs associated with past operations at Building 41.

#### **2.6.1 Proposed Sampling Plan**

Table 2-6 lists the groundwater well that will be sampled at Site 6, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The location of this well is shown on Figure 1-3.

#### **2.6.2 Sampling Plan Rationale**

Well M06-06 is screened in the FWBZ. This well is located adjacent to Building 41, in the central portion of the solvent plume located west of the building. Samples from this well will be collected and analyzed for VOCs each quarter. VOC data will be used to monitor solvent concentrations within the plume.

Samples from well M06-06 will also be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from this well will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents found at Site 6; a high TOC concentration indicates a high biodegradation potential.

### **2.7 SITE 7 - BUILDING 459, NAVY EXCHANGE FUEL STATION**

Site 7 is located in the east-central portion of NAS Alameda, near the base perimeter (Figure 1-2). The site has been a fuel station and auto repair shop since 1966. During operations, eight underground storage tanks (UST) have been used at the site. Six of these USTs contained motor vehicle fuel. The two remaining tanks contained waste oil and solvent. Five of the fuel tanks and the waste oil tank were reported to have leaked at one time during their service (PRC 1993c).

Currently, there are 14 active groundwater monitoring wells at Site 7. Prior sampling of these wells has detected petroleum hydrocarbons (including VOCs) associated with the UST releases.

### **2.7.1 Proposed Sampling Plan**

Table 2-7 lists the five groundwater wells that will be sampled at Site 7, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

### **2.7.2 Sampling Plan Rationale**

Well W-1 is located in the center of the petroleum hydrocarbon plume originating at Site 7. The remaining wells that will be sampled at the site are located near the margins of the plume, which is migrating to the southeast.

Wells W-1 and M07A-04 are screened in the FWBZ. Well M07A-03 is screened in the BSA. Samples from these three wells will be analyzed quarterly for VOCs. Samples from well D07A-02 and well M07A-09, screened in the SWBZ and the BSA, respectively, will also be analyzed quarterly for VOCs. These two wells are located on the downgradient edge of the plume toward the southeast. Data from the VOC and petroleum hydrocarbon analyses (noted below) will be used to assess the migration of the petroleum hydrocarbon plume at Site 7.

Samples from each of the five wells will also be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from three wells (W-1 and M07A-04, screened in the FWBZ, and well M07A-03, screened in the BSA) will be analyzed quarterly for TPPH and TEPH.

Samples from each of the wells will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the petroleum hydrocarbons found at Site 7; a high TOC concentration indicates a high biodegradation potential.

## **2.8 SITE 9 - BUILDING 410, PAINT STRIPPING**

Site 9 is located in the southeast portion of NAS Alameda (Figure 1-2). Building 410, located on the site, housed an aircraft paint stripping operation until 1991. Solvents, paints, and oils were used at the site (PRC 1993c).

Currently, there are seven active groundwater monitoring wells associated with Site 9. Prior sampling of these wells has detected low concentrations of solvents in groundwater at the site. Petroleum hydrocarbons, however, were not detected in these wells.

### **2.8.1 Proposed Sampling Plan**

Table 2-9 lists the two groundwater wells that will be sampled at Site 9, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

### **2.8.2 Sampling Plan Rationale**

Wells M09-06 and D09-01 are screened in the FWBZ. Samples from these wells will be collected and analyzed for VOCs each quarter. VOC data will be used to monitor solvent concentrations at the site.

Samples from the two wells will also be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from each of the wells will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents; a high TOC concentration indicates a high biodegradation potential.

## **2.9 SITE 11 - BUILDING 14, ENGINE TEST CELL**

Site 11 is located immediately east of the Seaplane Lagoon (Figure 1-2). Building 14, located on the site, was used as an aircraft engine test facility. Fuels, solvents, cleaning chemicals, and lubricants were used

and stored at the site (PRC 1993c). Solvents have also been detected in samples from nearby Site 4, and the relationship between the plumes at Sites 4 and 11 is still being evaluated.

Currently, there are seven groundwater monitoring wells at Site 11. Prior sampling of these wells has detected solvents in groundwater at the site. Petroleum hydrocarbons were not detected in Site 11 groundwater samples.

### **2.9.1 Proposed Sampling Plan**

Table 2-11 lists the five groundwater wells that will be sampled at Site 11 (including monitoring well M07B-01, installed during the investigation at Site 21), identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

### **2.9.2 Sampling Plan Rationale**

The five wells that will be sampled at Site 11 are screened in the FWBZ. Samples from these wells will be collected and analyzed quarterly for VOCs. VOC data will be used to monitor solvent concentrations at the site and further evaluate the source of the solvents in groundwater. Data from well M03-05 (see Section 2.3) will also be used to assess the extent of solvents in groundwater and explore the relationship between the solvent plumes reported at Sites 4 and 11.

Samples from all five wells will also be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from each of the wells will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents; a high TOC concentration indicates a high biodegradation potential.

## **2.10 SITE 12 - BUILDING 10, POWER PLANT**

Site 12 is located north of the Seaplane Lagoon, near Site 5 (Figure 1-2). Building 10, located on the site, serves as a power plant. Nine aboveground diesel tanks, located on the south side of the building, provide backup fuel for the boilers. Five USTs containing bunker fuel were also located along the northeast side of the building and were closed in place in 1993. Fuel oil spills have been reported at the site (PRC 1993c).

Currently, there are five groundwater monitoring wells at Site 12. Prior sampling of these wells has detected solvents associated with Site 5 in groundwater samples. Despite fuel oil spills in the vicinity of Site 12 and engine maintenance activities to the north, petroleum hydrocarbons were not detected in groundwater samples from these wells.

### **2.10.1 Proposed Sampling Plan**

Table 2-12 lists the groundwater well that will be sampled at Site 12, identifies the parameters for which the samples will be analyzed for, and specifies the sampling frequency for each parameter. The location of this well is shown on Figure 1-3.

### **2.10.2 Sampling Plan Rationale**

Well M12-01 is screened in the FWBZ and is near the margin of the solvent plume originating at Site 5. Samples from this well will be collected and analyzed for VOCs each quarter. VOC data will be used to monitor solvent concentrations associated with Site 5.

Samples from this well will be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of beneficial uses of groundwater at NAS Alameda. The metals data will also be used to assess potential impacts from boiler blowdown water released from Building 10 near well M12-01.

Samples from this well will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents; a high TOC concentration indicates a high biodegradation potential.

## **2.11**

### **SITE 13 - FORMER OIL REFINERY**

Site 13 is located in the southeast portion of NAS Alameda (Figure 1-2). The site occupies approximately 30 acres and was operated as a refinery from 1879 to 1903. Refinery wastes and asphaltic residues were dumped at the site during this period. During prior environmental investigations, a layer of black, tar-like material was encountered in two soil borings drilled at the site. The site is largely an empty lot at this time (PRC 1993c). Sites 19, 22, and 23 are located within the boundary of Site 13.

Currently, there are ten groundwater monitoring wells at Site 13. Prior sampling of these wells has detected petroleum hydrocarbons as well as benzene, toluene, ethylbenzene and xylene compounds (collectively known as BTEX) in groundwater at the site.

#### **2.11.1 Proposed Sampling Plan**

Table 2-13 lists the four groundwater wells that will be sampled at Site 13, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3. The boundaries of Site 19 lie within Site 13 and the two Sites will be considered together.

#### **2.11.2 Sampling Plan Rationale**

Well M13-06 is located in the center of the petroleum hydrocarbon plume originating at Site 13. The remaining three wells that will be sampled at the site are located near the margins of the plume, which is migrating to the southeast. All four wells are screened in the FWBZ.

Samples from all four wells will be analyzed quarterly for VOCs. Samples from well M13-06 will also be analyzed for SVOCs each quarter. Data from these analyses (and from TPH analyses, noted below) will be used to assess the migration of the petroleum hydrocarbon plume at the site. Data from well MW530-2, located at Site 23 (see Section 2.10), will also be used to assess the extent of petroleum hydrocarbons originating at Site 13.

Samples from each of the four wells will also be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from all four wells will be analyzed quarterly for TPPH and TEPH.

Samples from each of the wells will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the petroleum hydrocarbons; a high TOC concentration indicates a high biodegradation potential.

## **2.12 SITE 14 - FIRE TRAINING AREA**

Site 14 is located on the northern perimeter of NAS Alameda (Figure 1-2). The site was used as a fire training area and fire extinguisher discharge area. Waste fuels and oils were discharged at the site and were burned during training exercises (PRC 1993c).

Currently, there are four groundwater monitoring wells at Site 14. Prior sampling of these wells has detected petroleum hydrocarbons in groundwater at the site.

### **2.12.1 Proposed Sampling Plan**

Table 2-14 lists the groundwater well that will be sampled at Site 14, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The location of this well is shown on Figure 1-3.

### **2.12.2 Sampling Plan Rationale**

Well M101-A is located in an area where petroleum hydrocarbons have been previously detected. The well is screened in the FWBZ.

Samples from well M101-A will be analyzed quarterly for VOCs, TPPH, and TEPH. Data from these analyses will be used to assess petroleum hydrocarbon concentrations in the area.

The quarterly samples will also be analyzed for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from this well will also be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the petroleum hydrocarbons; a high TOC concentration indicates a high biodegradation potential.

## **2.13 SITE 16 - CANS C-2 AREA**

Site 16 is located in the southeastern corner of NAS Alameda (Figure 1-2). The site is a storage yard and includes an open storage area and a shipping container storage area. The area was formerly used to store solvents and paints; acids and bases; and transformers containing PCB oil. Leaking drums and PCB-oil transformers were reported at the site. Some PCB-contaminated soil was removed from the site in 1982 (PRC 1993c).

Currently, there are four groundwater monitoring wells at Site 16. Prior sampling of these wells has detected VOCs in groundwater at the site, but PCBs were not detected at Site 16.

### **2.13.1 Proposed Sampling Plan**

Table 2-15 lists the groundwater well that will be sampled at Site 16, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The location of this well is shown on Figure 1-3.

### **2.13.2 Sampling Plan Rationale**

Well M16-04 is located along the eastern boundary of Site 16, at the perimeter of NAS Alameda. This well is screened in the FWBZ. Samples from this well will be analyzed quarterly for VOCs. Data from these analyses will be used to assess groundwater quality associated with Site 16 and along the perimeter of NAS Alameda.

Samples from this well will also be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from this well will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for contaminants at this and other sites; a high TOC concentration indicates a high biodegradation potential.

#### **2.14 SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE**

Wells associated with Site 13 will be used to monitor groundwater quality associated with activities at the hazardous waste storage area; Site 19 is located within the boundary of Site 13. Sampling and sample analyses for Site 13 wells are discussed in Section 2.13.

#### **2.15 SITE 22 - BUILDING 547, SERVICE STATION**

Site 22 is located in the southeast portion of NAS Alameda, near the base perimeter (Figure 1-2). The site was a fuel station with five USTs. Three of which contained motor vehicle fuel. The two remaining tanks contained waste oil; the waste oil, however was not suspected to contain PCBs. One of the fuel tanks was reportedly ruptured by a tank measuring rod in 1980 (PRC 1993c).

Currently, there are five active groundwater monitoring wells at Site 22. Prior sampling of these wells has detected petroleum hydrocarbons (including VOCs) associated with the UST release.

##### **2.15.1 Proposed Sampling Plan**

Table 2-8 lists the four groundwater wells that will be sampled at Site 22, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

##### **2.15.2 Sampling Plan Rationale**

Well MW547-4 is located in the part of the petroleum hydrocarbon plume exhibiting the highest concentrations compared to groundwater samples from the remaining monitoring wells in this area. The

three remaining wells that will be sampled at the site are located near the downgradient margins of the plume, which is migrating to the east. These four wells are screened in the FWBZ. Data from these wells will be used to evaluate the migration of the plume originating at Site 22, and petroleum hydrocarbons originating at Site 13.

Samples from wells MW547-4, M07C-07, and D07C-01 will be analyzed for VOCs, TPPH, and TEPH each quarter. In addition, samples from well M07C-08 will be analyzed quarterly for VOCs. Data from the VOC and petroleum hydrocarbon analyses will be used to assess the migration of the petroleum hydrocarbon plume at the site.

Samples from each of the four wells will be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from each of the wells will also be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the petroleum hydrocarbons; a high TOC concentration indicates a high biodegradation potential.

## **2.16 SITE 23 - BUILDING 530, MISSILE REWORK OPERATIONS**

Site 23 is located in the southeastern portion of NAS Alameda (Figure 1-2). Building 530, located on the site, was used as a missile rework facility beginning in 1972 and continuing until the closure of NAS Alameda in 1997. Solvents and paint wastes were used and stored at the site (PRC 1993c).

Currently, there are six groundwater monitoring wells at Site 23. Prior sampling of these wells has detected solvents in groundwater at the site.

### **2.16.1 Proposed Sampling Plan**

Table 2-10 lists the two groundwater wells that will be sampled at Site 23, identifies the parameters for which the samples will be analyzed, and specifies the sampling frequency for each parameter. The locations of these wells are shown on Figure 1-3.

## **2.16.2            Sampling Plan Rationale**

Wells D10B-02 and MW530-2 are screened in the FWBZ. Samples from these wells will be collected and analyzed for VOCs each quarter. VOC data will be used to monitor solvent concentrations at the site.

Samples from both wells will also be analyzed quarterly for metals and general water quality parameters. Data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from well MW530-2 will also be analyzed quarterly for TPPH and TEPH to provide data to evaluate the southern extent of the petroleum hydrocarbons originating at Site 13.

Samples from each the wells will be analyzed for TOC during the first quarterly sampling event. TOC data will be used to help evaluate the biodegradation potential for the solvents; a high TOC concentration indicates a high biodegradation potential.

## **2.17                OFF-BASE WELLS AND ON-BASE BACKGROUND WELLS**

Four groundwater monitoring wells have been installed at NAS Alameda to provide background water quality data. These wells (MBG-1 through MBG-4) are located near the eastern and northeastern perimeters of the base (Figure 1-3). Nine off-base wells, located within one mile of NAS Alameda, may also be sampled to determine if the quality of the groundwater in the first water bearing zone can support beneficial use.

### **2.17.1            Proposed Sampling Plan**

Table 2-16 lists the four on-base background and potentially nine off-base groundwater wells that will be sampled, identifies the parameters for which the groundwater samples will be analyzed, and specifies the sampling frequency for each parameter.

### **2.17.2 Sampling Plan Rationale**

Each of the four on-base background monitoring wells is screened in the FWBZ and will be sampled on a quarterly basis. The nine off-base monitoring wells, if sampled, are also screened in the FWBZ.

Samples from the on-base background wells will be analyzed quarterly for VOCs, SVOCs, pesticides/PCBs, metals, general water quality parameters, TPH, TEPH, and TOC. The data from these analyses will be used in a base-wide analysis of ambient water quality and an evaluation of the beneficial uses of groundwater at NAS Alameda.

Samples from the off-base wells, if collected, will be analyzed for metals, general water quality parameters, and TOC. The data from these analyses will be used to determine if the quality of the groundwater in the first water bearing zone can support beneficial use.

**TABLE 2-1**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 1**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M028-A	FWBZU	Q	Q	--	Q	Q	Q	Q	Once
M033-A	FWBZU	Q	--	--	Q	Q	--	--	--
M034-A	FWBZU	Q	Q	--	Q	Q	Q	Q	Once
M035-A	FWBZU	Q	--	--	Q	Q	--	--	--
M001-E	FWBZL	Q	Q	--	Q	Q	--	--	--
M003-E	FWBZL	Q	--	--	Q	Q	--	--	--
M027-E	FWBZL	Q	--	--	Q	Q	--	--	--
M028-E	FWBZL	Q	Q	--	Q	Q	Q	Q	Once
M029-E	FWBZL	Q	Q	--	Q	Q	--	--	--
M030-E	FWBZL	Q	--	--	Q	Q	--	--	--
M031-E	FWBZL	Q	--	--	Q	Q	--	--	--
M028-C	SWBZL	Q	--	--	Q	Q	Q	Q	Once
M002-E	BSA	Q	Q	--	Q	Q	--	--	--

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

BSA = Bay Sediment Aquitard

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

SWBZL = Second Water-bearing Zone with well screened in lower portion of the unit

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-2**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 2**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M010-A	FWBZU	Q	--	--	Q	Q	--	--	--
M013-A	FWBZU	Q	--	--	Q	Q	--	--	--
M017-A	FWBZU	Q	--	--	Q	Q	--	--	--
M024-A	FWBZU	Q	Twice	--	Q	Q	--	--	--
M036-A	FWBZU	Q	Twice	Q	Q	Q	--	--	--
M036-E	FWBZU	Q	Twice	--	Q	Q	--	--	--
M037-A	FWBZU	Q	Twice	Q	Q	Q	--	--	--
M038-A	FWBZU	Q	Twice	Q	Q	Q	--	--	--
M038-E	FWBZU	Q	Twice	--	Q	Q	--	--	--
M039-A	FWBZU	Q	Twice	Q	Q	Q	--	--	--
M039-E	FWBZU	Q	Twice	--	Q	Q	--	--	--
M019-E	FWBZL	Q	Q	--	Q	Q	--	--	--
M021-E	FWBZL	Q	--	--	Q	Q	--	--	--
M023-E	FWBZL	Q	Q	--	Q	Q	--	--	--
M024-E	FWBZL	Q	Twice	--	Q	Q	--	--	--
M037-E	FWBZL	Q	--	--	Q	Q	--	--	--
M036-B	SWBZU	Q	--	--	Q	Q	--	--	--
M038-B	SWBZU	Q	--	--	Q	Q	--	--	--
M037-B	SWBZL	Q	--	--	Q	Q	--	--	--
M039-B	SWBZL	Q	--	--	Q	Q	--	--	--

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Twice = Well samples analyzed for this parameter during the first and third sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

SWBZL = Second Water-bearing Zone with well screened in lower portion of the unit

SWBZU = Second Water-bearing Zone with well screened in upper portion of the unit

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-3**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 3**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M03-04	FWBZU	Q	--	--	Q	Q	Q	Q	Once
M03-05	FWBZU	Q	--	--	Q	Q	--	--	Once
M03-07	FWBZU	Q	--	--	Q	Q	Q	Q	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-4**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 4**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M04-05	FWBZU	Q	--	--	Q	Q	--	--	Once
M04-06	FWBZU	Q	--	--	Q	Q	--	--	Once
M04-07	FWBZU	Q	--	--	Q	Q	--	--	Once
MW360-1	FWBZU	Q	--	--	Q	Q	--	--	Once
MW360-2	FWBZU	Q	--	--	Q	Q	--	--	Once
MW360-2	FWBZU	Q	--	--	Q	Q	--	--	Once
MW360-4	FWBZU	Q	--	--	Q	Q	--	--	Once
D04-02	FWBZL	Q	--	--	Q	Q	--	--	Once
D04-03	FWBZL	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-5**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITES 5 AND 10**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M05-04	FWBZU	Q	--	--	Q	Q	--	--	Once
M05-05	FWBZU	Q	--	--	Q	Q	--	--	Once
M05-09	FWBZU	Q	--	--	Q	Q	--	--	Once
M05-10	FWBZU	Q	--	--	Q	Q	--	--	Once
M05-01	FWBZL	Q	--	--	Q	Q	--	--	Once
M05-02	FWBZL	Q	--	--	Q	Q	--	--	Once
M05-03	FWBZL	Q	--	--	Q	Q	--	--	Once
M05-06	FWBZL	Q	--	--	Q	Q	--	--	Once
M05-07	FWBZL	Q	--	--	Q	Q	--	--	Once
M05-08	FWBZL	Q	--	--	Q	Q	--	--	Once
M05-11	FWBZL	Q	--	--	Q	Q	--	--	Once
M05-12	FWBZL	Q	--	--	Q	Q	--	--	Once
M05HW-01	FWBZL	Q	--	--	Q	Q	--	--	Once
M05BS-01	FWBZL	Q	--	--	Q	Q	--	--	Once
M10-01	FWBZL	Q	--	--	Q	Q	--	--	Once
D05-02	SWBZU	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

SWBZU = Second Water-bearing Zone with well screened in upper portion of the unit

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-6**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 6**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M06-06	FWBZL	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-7**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 7**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
W-1	FWBZU	Q	--	--	Q	Q	Q	Q	Once
M07A-04	FWBZL	Q	--	--	Q	Q	Q	Q	Once
D07A-02	SWBZL	Q	--	--	Q	Q	--	--	Once
M07A-03	BSA	Q	--	--	Q	Q	Q	Q	Once
M07A-09	BSA	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

BSA = Bay Sediment Aquitard

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

SWBZL = Second Water-bearing Zone with well screened in lower portion of the unit

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-8**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 9**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M09-06	FWBZU	Q	--	--	Q	Q	--	--	Once
D09-01	FWBZL	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-9**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITES 11 AND 21**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M11-01	FWBZU	Q	--	--	Q	Q	--	--	Once
M11-02	FWBZU	Q	--	--	Q	Q	--	--	Once
M11-05	FWBZU	Q	--	--	Q	Q	--	--	Once
M11-06	FWBZU	Q	--	--	Q	Q	--	--	Once
M07B-01	FWBZU	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-10**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 12**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M12-01	FWBZL	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-11**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITES 13 AND 19**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M13-06	FWBZU	Q	Q	--	Q	Q	Q	Q	Once
M13-09	FWBZU	Q	--	--	Q	Q	Q	Q	Once
MWOR-5	FWBZU	Q	--	--	Q	Q	Q	Q	Once
MWD13-3	FWBZU	Q	--	--	Q	Q	Q	Q	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-12**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 14**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M101-A	FWBZU	Q	--	--	Q	Q	Q	Q	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-13**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 16**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M16-04	FWBZU	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-14**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 22**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
M07C-07	FWBZU	Q	--	--	Q	Q	Q	Q	Once
M07C-08	FWBZU	Q	--	--	Q	Q	--	--	Once
MW547-4	FWBZU	Q	--	--	Q	Q	Q	Q	Once
D07C-01	FWBZL	Q	--	--	Q	Q	Q	Q	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-15**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS: SITE 23**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
MW530-2	FWBZU	Q	--	--	Q	Q	Q	Q	Once
D10B-02	FWBZL	Q	--	--	Q	Q	--	--	Once

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

Once = Well samples analyzed for this parameter only during the first sampling event

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

**TABLE 2-16**  
**MONITORING WELLS AND ANALYTICAL PARAMETERS:**  
**BACKGROUND AND OFF-BASE WELLS**

WELL NAME	UNIT <sup>1</sup>	ANALYTICAL PARAMETER							
		VOCs	SVOCs	Pesticides and PCBs	Metals	General Water Quality <sup>2</sup>	TPPH	TEPH	TOC
Background Wells									
MBG-1	FWBZU	Q	Q	Q	Q	Q	Q	Q	Q
MBG-2	FWBZL	Q	Q	Q	Q	Q	Q	Q	Q
MBG-3	FWBZL	Q	Q	Q	Q	Q	Q	Q	Q
MBG-4	FWBZL	Q	Q	Q	Q	Q	Q	Q	Q
Off-base Wells <sup>3</sup>									
CW-1	FWBZU	--	--	--	Q	Q	--	--	Q
CW-2	FWBZU	--	--	--	Q	Q	--	--	Q
CW-3	FWBZU	--	--	--	Q	Q	--	--	Q
CW-4	FWBZU	--	--	--	Q	Q	--	--	Q
CW-5	FWBZU	--	--	--	Q	Q	--	--	Q
CW-6	FWBZU	--	--	--	Q	Q	--	--	Q
CW-7	FWBZU	--	--	--	Q	Q	--	--	Q
CW-8	FWBZU	--	--	--	Q	Q	--	--	Q
CW-9	FWBZU	--	--	--	Q	Q	--	--	Q

**Notes:**

1 "Unit" refers to the hydrostratigraphic unit in which the well is screened.

2 General Water Quality parameters include: anions, sulfide, alkalinity, and nitrate as nitrogen/nitrite as nitrogen.

3 Specific off-base wells have not yet been selected for sampling

FWBZL = First Water-bearing Zone with well screened in lower portion of the unit

FWBZU = First Water-bearing Zone with well screened in upper portion of the unit

PCB = Polychlorinated biphenyls

Q = Well samples analyzed for this parameter on a quarterly basis

SVOC = Semi-volatile organic compounds

TEPH = Total extractable petroleum hydrocarbons

TOC = Total organic carbon

TPPH = Total purgable petroleum hydrocarbons

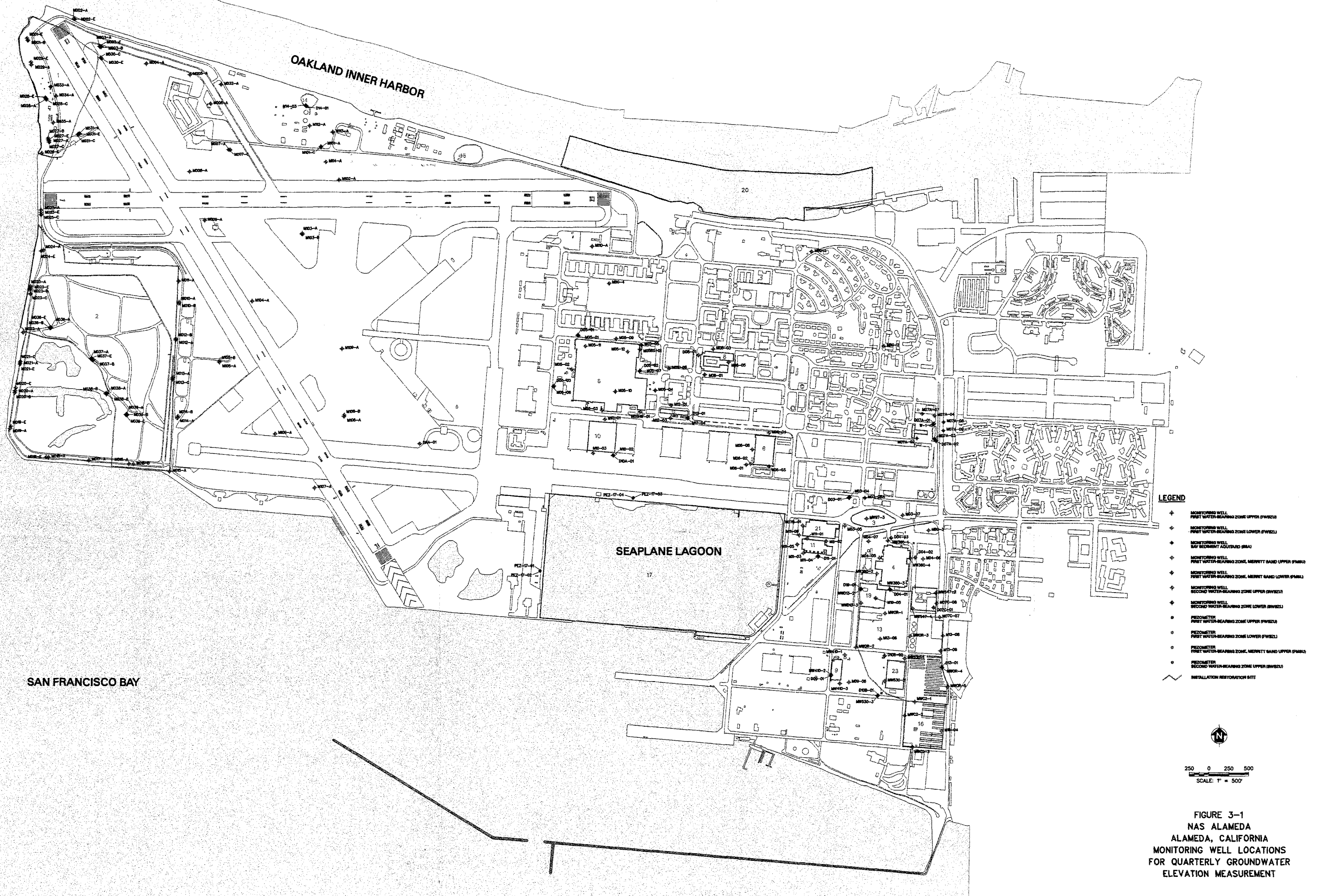
VOC = Volatile organic compounds

-- = Samples not analyzed for this parameter

### **3.0 GROUNDWATER ELEVATION MEASUREMENT**

Prior to each quarterly sampling event, groundwater elevation measurements will be made at 214 wells including 205 on-base wells and nine off-base wells. The locations of the on-base wells are shown on Figure 3-1; locations for the off-base wells will be provided once these wells have been identified. The groundwater elevation data will be used to prepare potentiometric maps for the various water-bearing zones at NAS Alameda and to evaluate groundwater movement at NAS Alameda. Groundwater elevation data, in conjunction with data obtained during previous investigations, including tidal influence studies, will be used to further assess the following specific hydrogeologic conditions at the base:

- Evaluating the hydrogeologic conditions influencing groundwater flow and contaminant migration in the area near Site 4 where the BSA thins out and is no longer present.
- Evaluating the impact on groundwater flow and contaminant migration resulting from utilities/storm drain corridors in the subsurface near Sites 5, 10, and 12.
- Evaluating the impact on groundwater flow and contaminant migration resulting from tidal influence at sites near San Francisco Bay, the Oakland Inner Harbor, and the Seaplane Lagoon.
- Evaluating how petroleum hydrocarbons migrated into the SWBZ at Site 7.



#### **4.0 TECHNICAL APPROACH**

Groundwater elevation measurement, groundwater sampling, sample custody control, and sample analysis will be conducted in accordance with the Standard Operating Procedures presented in Appendix A of the FSP (Volume IIa of this Groundwater Monitoring Plan). Quality assurance and quality control procedures that will be followed to assure accurate, representative data are specified in the QAPP (Volume IIb of this Groundwater Monitoring Plan).

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**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**  
**Northern and Central California, Nevada, and Utah**  
**Contract No. N62474-94-D-7609 (CLEAN II)**  
**Contract Task Order No. 0108**

**Prepared For**

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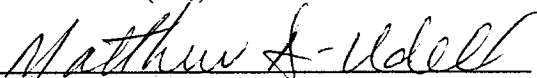
**NAVAL AIR STATION ALAMEDA**  
**ALAMEDA, CALIFORNIA**

**GROUNDWATER MONITORING PLAN**  
**VOLUME IIa: FIELD SAMPLING PLAN**  
**FINAL**

**OCTOBER 1997**

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### **Appendix**

- A STANDARD OPERATING PROCEDURES

### **FIGURES**

#### **Figure**

- 1-1 REGIONAL LOCATION MAP  
1-2 QUARTERLY GROUNDWATER SAMPLING MONITORING WELL LOCATIONS

### **TABLES**

#### **Table**

- 3-1 PROPOSED GROUNDWATER AND QUALITY CONTROL SAMPLES AND ANALYSES

## ACRONYMS AND ABBREVIATIONS

Canonie	Canonie Environmental Services Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action Navy
CLP	Contract Laboratory Program
COC	Chain of Custody
CTO	Contract Task Order
EFA West	Engineering Field Activity West
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
HSP	Health and Safety Plan
IDW	Investigative-Derived Waste
MP	Monitoring Plan
NAS	Naval Air Station
PCB	Polychlorinated Biphenyl
PRC	PRC Environmental Management, Inc.
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TPH	Total Petroleum Hydrocarbons
U&A	Uribe and Associates
VOC	Volatile Organic Compound
WESTDIV	Western Division, Naval Facilities Engineering Command

## 1.0 INTRODUCTION

This Field Sampling Plan (FSP) is Volume IIa of the Groundwater Monitoring Plan and was prepared under the Comprehensive Long-Term Environmental Action Navy Contract No. N62474-94-D-7609 (CLEAN II), issued by the Department of the Navy, Engineering Field Activity West (EFA West).

This FSP describes quarterly groundwater sampling activities for 91 existing groundwater monitoring wells located at Naval Air Station (NAS) Alameda and potentially 9 off-base water wells located in the City of Alameda within one mile of NAS Alameda. Field activities, sample collection methods and procedures to be followed are discussed in this plan.

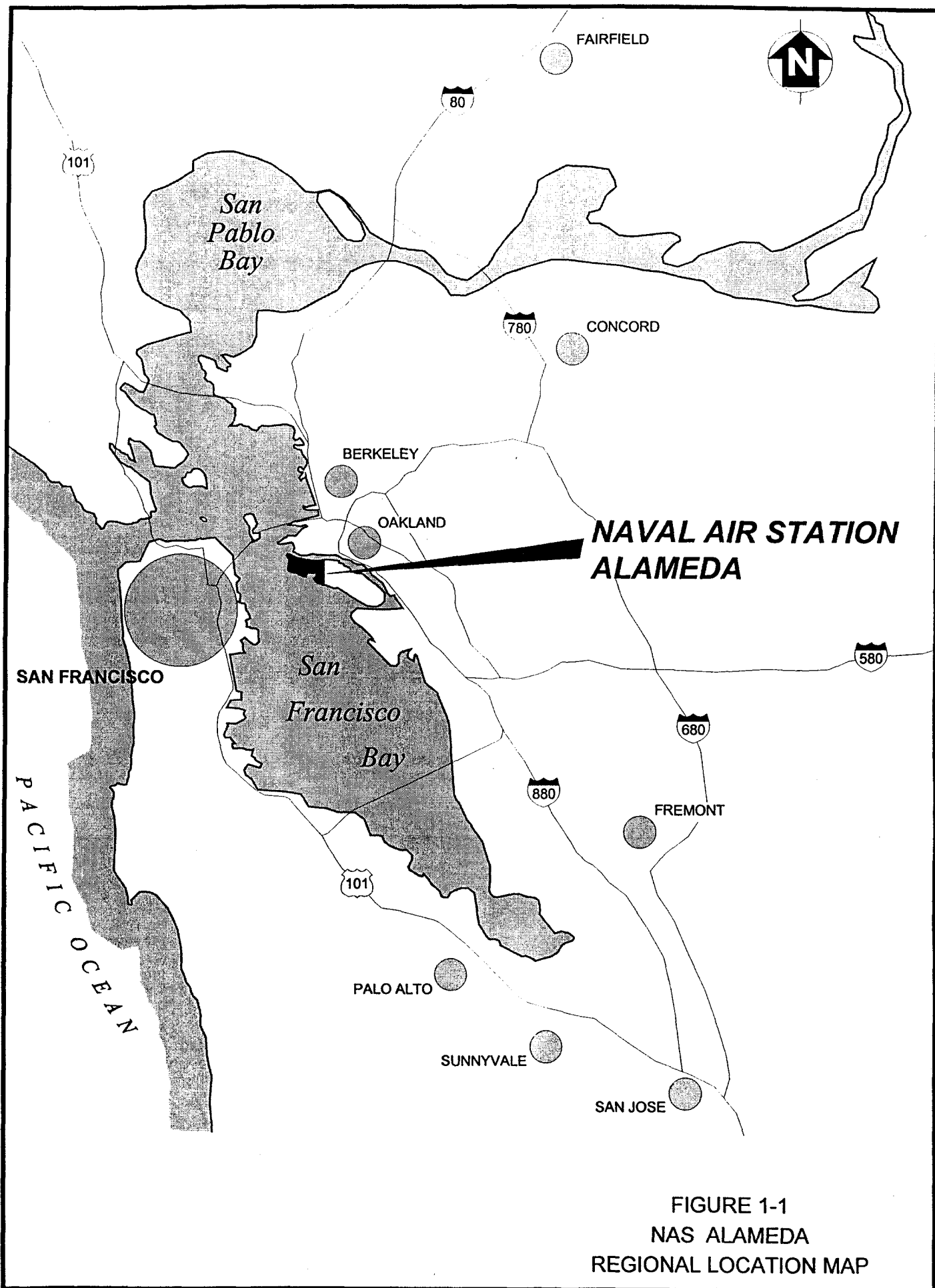
PRC Environmental Management, Inc. (PRC) authorized Uribe and Associates (U&A) to generate this Groundwater Monitoring Plan and conduct water-level measurements, a tidal study, quarterly groundwater sampling, and other tasks at NAS Alameda under Contract Task Order (CTO) No. 108. This plan consists of: Volume I, the Monitoring Plan (MP) and Volume II, the Sampling and Analysis Plan (SAP). The SAP, in turn, consists of: Volume IIa, this FSP; Volume IIb, a Quality Assurance Project Plan (QAPP) Addendum; and Volume IIc, a Health and Safety Plan (HSP) Addendum.

### 1.1 SITE BACKGROUND

NAS Alameda is located on the east side of San Francisco Bay in Alameda, California (Figure 1-1). NAS Alameda occupies the western end of the island of Alameda and was officially closed in May 1997. Most of the eastern half of the station is developed with office and industrial facilities. Runways and support facilities occupy the western part of the station (Canonie Environmental Services Corporation [Canonie] 1989). Naval operations at NAS Alameda have ceased, with the exception of employees working on the base closure, base environmental cleanup, conversion of the base to civilian use, or managing biological resources.

Twenty-three potentially contaminated hazardous waste sites have been identified at NAS Alameda during the remedial investigation (RI); Figure 1-2 shows these sites (with the exception of Site 18, the facility-wide storm water system). General site hazards are both physical and chemical in nature. Physical hazards are similar at most of the sites. Due to the large acreage of NAS Alameda and the unique operations associated with each site, potential chemical hazards are site specific. Chemical contaminants identified at the sites include volatile organic compounds (VOC), semivolatile organic

compounds (SVOC), polychlorinated biphenyls (PCB), pesticides, petroleum hydrocarbons, metals, and alpha and/or beta radiation (PRC 1993). A more detailed description of the site hazards and recommended controls can be found in Volume IIc of the Groundwater Monitoring Plan, the HSP Addendum, and its reference document, the NAS Alameda Basewide Health and Safety Plan (PRC 1997).





## 2.0 OBJECTIVES

The objectives of the activities described in this FSP are to obtain analytical data from groundwater samples to characterize the distribution and concentration of chemicals present in the groundwater underlying NAS Alameda and in the nearby vicinity. The data will be used to:

- Monitor seasonal trends in water levels and chemical concentrations in groundwater
- Provide additional data on background water quality
- Monitor groundwater movement and assess the potential for contaminant migration through the groundwater
- Provide data to support future risk assessment and feasibility study activities, as required

These data will supplement the existing soil and groundwater analytical data collected during the RI currently being conducted at NAS Alameda. This FSP will provide a description of planned field activities, groundwater sampling procedures, sampling locations, analytical parameters, sample designation and control, and investigation-derived waste (IDW) handling. A more detailed discussion of the rationale used for selecting the monitoring wells to be sampled in this sampling program can be found in the Section 2.0 of the MP.

### **3.0 FIELD INVESTIGATION**

To characterize the extent of contamination at NAS Alameda, groundwater samples will be collected and submitted for laboratory analyses. Field activities, sampling procedures, analytical quality assurance and quality control, analyses to be performed, sample preservation, sample identification, sample control, and IDW handling are described in the following subsections.

#### **3.1 FIELD ACTIVITIES**

Four quarterly rounds of groundwater sampling are proposed over the course of one year. Prior to each round of groundwater sampling, water level measurements will be taken from approximately 214 wells (including 205 on-base and potentially 9 off-base wells) to provide depth to groundwater information from the various hydrostratigraphic units underlying NAS Alameda.

Groundwater samples will be collected from 100 sampling locations during each sampling round, including samples from 91 on-base groundwater monitoring wells (Figure 1-2) and potentially 9 off-base water wells. Quality assurance/quality control (QA/QC) samples will also be collected during each of the four rounds of sampling.

During field work, PRC and U&A will maintain daily contact with the field crew, the project chemist, and the analytical laboratory to assure that sample handling and record keeping are correctly executed.

#### **3.2 PROCEDURES AND APPROACH**

This groundwater sampling program is designed to collect samples that will provide supplemental groundwater chemistry data for the remedial investigation/feasibility study (RI/FS) at NAS Alameda. The groundwater sampling procedure will consist of (1) taking water level measurements, (2) purging the wells, (3) collecting and shipping samples, and (4) handling IDW generated during sampling activities.

The field procedures to be employed during this investigation will be in accordance with the PRC Standard Operating Procedures (SOPs). Specific SOPs that apply to this investigation include:

- SOP No. 002 General Equipment Decontamination
- SOP No. 003 Organic Vapor Air Monitoring

- SOP No. 010 Groundwater Sampling
- SOP No. 011 Field Measurement of Water Temperature
- SOP No. 012 Field Measurement of pH
- SOP No. 013 Field Measurement of Specific Conductance
- SOP No. 018 Sample Custody
- SOP No. 019 Packaging and Shipping Samples
- SOP No. 024 Recording Notes in the Field Logbook
- SOP No. 065 Colorimetric Indicator Detector

Note that disposable bailers will be used to purge and sample the on-base monitoring wells, rather than stainless steel or Teflon bailers as described in SOP No. 010. Copies of the SOPs that apply to this investigation are included in Appendix A of this FSP.

### **3.2.1 Groundwater Level Measurements**

Prior to each groundwater sampling round, water level measurements will be taken in approximately 205 on-base wells. If warranted, water level measurements will also be taken in the nine off-base water wells to be sampled; water-level measurements may not be possible because of installed equipment (pumps). Where performed, depth to groundwater measurement procedures will be in accordance with Section 2.3.1 of the PRC SOP for groundwater sampling (SOP No. 010) included in Appendix A of this FSP.

### **3.2.2 Well Purging**

Prior to collecting samples, wells will be purged by removing up to five well volumes of water to ensure that the groundwater samples collected are representative of aquifer conditions. Purging procedures for on-base monitoring wells may be different than the procedures for the off-base water wells.

On-base monitoring wells will be purged until the physical parameters (temperature, pH, conductivity) measured during the purging process stabilize. Unless the well goes dry during purging, a minimum of three and a maximum of five well-casing volumes will be removed during purging. If the physical

parameters do not stabilize, the well will be considered adequately purged after five well-casing volumes are removed. Physical parameters will be measured in the field during purging in accordance with PRC SOP Nos. 011, 012, and 013 (Appendix A).

Off-base water wells may be used for domestic landscape irrigation and may have a pump installed, such that the well is permanently sealed. Total depth of the well and depth to groundwater may not be measurable in these wells and, therefore, the well volume will be estimated based on total depth and casing diameter information from well logs, if available. As with on-base monitoring wells, three to five well volumes will be purged from off-base water wells if the well volume can be calculated or estimated. To purge wells in which the well volume cannot be estimated from available data, the existing pump will be turned on prior to sampling and the water will be pumped for approximately five minutes. This five minute period should be sufficient to remove stagnant water that might be present in the well and replace it with water that is representative of aquifer conditions. Physical parameters will be measured and recorded during purging, as with on-base monitoring wells.

### **3.2.3 Sample Collection**

Upon completion of well purging, groundwater samples will be collected from on-base monitoring wells using a disposable bailer and poured into laboratory-prepared sample bottles as described in SOP No. 010 (Appendix A of this FSP). Samples from off-base water wells will be collected directly from the pump outlet, rather than with a bailer, and poured into sample bottles.

If an on-base well is purged dry before three well-casing volumes are removed, or before well purging is complete, groundwater to be analyzed for VOCs or total petroleum hydrocarbons (TPH) as purgeables will be collected as soon as sufficient water is present in the well. The groundwater for other analytical parameters will be collected after the well has recovered to 80% of the initial water level, but no later than 24 hours after purging. Similarly, if a monitoring well becomes dry during sample collection, and insufficient groundwater is available to completely fill the sample bottles, the samples to be analyzed for VOCs and TPH as purgeables will be collected first and any remaining samples will be collected once the well has recovered, but within 24 hours.

Groundwater destined for metals analyses will be filtered in the field. The required volume of water will be collected in a laboratory-cleaned, unpreserved, 1-liter plastic bottle. The water from this unpreserved

sample bottle will be filtered into a laboratory-cleaned, nitric-acid-preserved, 1-liter plastic bottle. The filtering and transfer process will be done with a peristaltic pump and 15-millimeter Tygon® tubing using a 0.45-micron filter.

After sample collection, sample bottles will be packed in refrigerated coolers (cooled to 4°C or less using ice) and shipped to the laboratory under chain of custody (COC) control as discussed in Section 3.7.

### **3.3 QUALITY ASSURANCE AND QUALITY CONTROL SAMPLES**

Field QA/QC samples will be collected to assure that accurate and representative environmental samples are obtained and to assure that the analytical data are valid. The following field QA/QC samples are proposed for each quarterly sampling event:

- field duplicate samples from approximately 10% of the monitoring wells
- trip blanks (one per sampling day)

Field duplicates are samples collected in duplicate from selected wells to evaluate the precision of the analytical laboratory. Trip blanks are samples of analyte-free water originating from the laboratory and packed and shipped back to the laboratory unopened with the investigative samples. Trip blanks are analyzed for VOCs to evaluate the level of VOC contamination, if any, introduced during sample shipment. QA/QC samples are discussed further in Section 5.4 of the QAPP. Groundwater sampling equipment will be disposable, thus no groundwater sampling equipment rinsate blanks are proposed.

### **3.4 ANALYSES**

A list of proposed samples and the analyses to be requested for each well during the first sampling round of this program is shown in Table 3-1. Analyses will be performed by a subcontracted laboratory, certified under the U.S. Environmental Protection Agency (EPA) Contract Laboratory Program (CLP). Laboratory procedures will be conducted in accordance with CLP protocol. Data deliverables will fulfill EPA Level IV requirements for use in calculating risk.

### **3.5                    SAMPLE CONTAINERS AND PRESERVATION REQUIREMENTS**

Pre-cleaned sample containers provided by the subcontracted laboratory will be used for sample collection and shipment. The samples will be preserved according to requirements for each analysis. The container requirements, preservatives, and holding times are summarized in Table 4-2 of the QAPP.

### **3.6                    SAMPLE DESIGNATION**

Groundwater and quality control samples will be assigned unique alphanumeric field and laboratory identification numbers, as described in Section 4.1 and shown on Table 4-1 of the QAPP.

### **3.7                    SAMPLE CONTROL**

Sample control will be documented to maintain sample quality during collection, transportation, and storage. Written records will include COC records, the field logbook, and a daily field progress summary sheet. Section 4.0 of the QAPP details these documentation procedures. Examples of a field notebook and a sample COC form are found in the appropriate SOPs (Appendix A). A field progress summary lists the sampling activities that occur during each day in the field.

#### **3.7.1                Chain of Custody**

A COC record will be used to record the unique sample identifier, the sample matrix, the date and time of collection, and the analyses requested for each sample collected. The COC record, filled out by the sampling personnel, will trace the possession of samples from the time of field collection through laboratory analysis. SOP No. 018 (Sample Custody) summarizes the procedure for COC records and is included in Appendix A of this FSP.

#### **3.7.2                Field Logbooks**

Sampling activities will be recorded daily in a bound field logbook with numbered pages. Entries will include general sampling information, field work dates and times, personnel present, equipment used, samples collected (including sample identification numbers), field conditions, names and purpose of any visitors, and any other pertinent information. Entries will be written in ink, with any incorrect

information crossed out with a single line and initialed, in accordance with SOP No. 024 (Recording Notes in the Field Logbook) found in Appendix A of this FSP.

### **3.7.3 Daily Field Progress Summary**

A field progress summary sheet will be submitted to the PRC Project Manager each day during sampling activities. A blank sheet, or a form created for this purpose may be used to document the topics detailed in Section 4.3.3 of the QAPP.

## **3.8 INVESTIGATION-DERIVED WASTE HANDLING**

Handling of IDW will be in accordance with the following procedures: wastewater generated during decontamination and purging of on-base monitoring wells will be temporarily contained in clearly labeled drums; disposable personal protective equipment (Tyvek, gloves) and other materials (paper towels, plastic sheeting) will be placed in large garbage bags for disposal as municipal waste. Groundwater removed during purging of off-base (non-contaminated) wells will not be considered IDW and will be used for irrigation purposes or discharged to storm drains.

Groundwater removed during purging of on-base wells and decontamination water will be transported in the collection drums on a daily basis to the NAS Alameda IDW staging area and transferred to large volume tanks. Sampling personnel will track and document the volume of wastewater generated and the method of storage. The wastewater will be segregated into separate tanks for contaminated and non-contaminated groundwater based on previous laboratory results from the monitoring wells of origin. If the previously detected constituents were below established action levels, the accumulated IDW will be disposed of by discharging it to the NAS Alameda sanitary sewer system. Contaminated wastewater will be treated and then discharged.

TABLE 3-1

**PROPOSED GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 1 of 5)

Well Number/ QC Sample	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 01</b>													
M001-E	Water	X	X	--	X	--	--	X	X	X	--	X	X
M002-E	Water	X	X	--	X	--	--	X	X	X	--	X	X
M003-E	Water	X	--	--	X	--	--	X	X	X	--	X	X
M027-E	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-A	Water	X	X	--	X	X	X	X	X	X	X	X	X
M028-C	Water	X	--	--	X	X	X	X	X	X	X	X	X
M028-E	Water	X	X	--	X	X	X	X	X	X	X	X	X
M028-E	Water	X	X	--	X	X	X	X	X	X	X	X	X
M028-E*	Water	X	X	--	X	X	X	X	X	X	X	X	X
M029-E	Water	X	X	--	X	--	--	X	X	X	--	X	X
M030-E	Water	X	--	--	X	--	--	X	X	X	--	X	X
M031-E	Water	X	--	--	X	--	--	X	X	X	--	X	X
M033-A	Water	X	--	--	X	--	--	X	X	X	--	X	X
M034-A	Water	X	X	--	X	X	X	X	X	X	X	X	X
M035-A	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 02</b>													
M010-A	Water	X	--	--	X	--	--	X	X	X	--	X	X
M013-A	Water	X	--	--	X	--	--	X	X	X	--	X	X
M017-A	Water	X	--	--	X	--	--	X	X	X	--	X	X
M019-E	Water	X	X	--	X	--	--	X	X	X	--	X	X
M019-E*	Water	X	X	--	X	--	--	X	X	X	--	X	X
M021-E	Water	X		--	X	--	--	X	X	X	--	X	X
M023-E	Water	X	X	--	X	--	--	X	X	X	--	X	X
M024-A	Water	X	X	--	X	--	--	X	X	X	--	X	X
M024-E	Water	X	X	--	X	--	--	X	X	X	--	X	X
M036-A	Water	X	X	X	X	--	--	X	X	X	--	X	X
M036-B	Water	X	--	--	X	--	--	X	X	X	--	X	X
M036-E	Water	X	X		X	--	--	X	X	X	--	X	X
M037-A	Water	X	X	X	X	--	--	X	X	X	--	X	X
M037-B	Water	X	--	--	X	--	--	X	X	X	--	X	X
M037-E	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 3-1

**PROPOSED GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 2 of 5)

Well Number/ QC Sample	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 02 (Continued)</b>													
M038-A	Water	X	X	X	X	--	--	X	X	X	--	X	X
M038-B	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-B*	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-E	Water	X	X	--	X	--	--	X	X	X	--	X	X
M039-A	Water	X	X	X	X	--	--	X	X	X	--	X	X
M039-B	Water	X	--	--	X	--	--	X	X	X	--	X	X
M039-E	Water	X	X	--	X	--	--	X	X	X	--	X	X
<b>Site 03</b>													
M03-04	Water	X	--	--	X	X	X	X	X	X	X	X	X
M03-05	Water	X	--	--	X	--	--	X	X	X	X	X	X
M03-07	Water	X	--	--	X	X	X	X	X	X	X	X	X
<b>Site 04</b>													
M04-05	Water	X	--	--	X	--	--	X	X	X	X	X	X
M04-06	Water	X	--	--	X	--	--	X	X	X	X	X	X
M04-07	Water	X	--	--	X	--	--	X	X	X	X	X	X
D04-03	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-1	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-2	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-3	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-4	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-4*	Water	X	--	--	X	--	--	X	X	X	X	X	X
<b>Site 05</b>													
M05-11	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-12	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-01	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-02	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-03	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-04	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-05	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-06	Water	X	--	--	X	--	--	X	X	X	X	X	X

TABLE 3-1

**PROPOSED GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 3 of 5)

Well Number/ QC Sample	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 05 (Continued)</b>													
M05-07	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-08	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-09	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-10	Water	X	--	--	X	--	--	X	X	X	X	X	X
D05-02	Water	X	--	--	X	--	--	X	X	X	X	X	X
D05-02*	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05HW-01	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05BS-01	Water	X	--	--	X	--	--	X	X	X	X	X	X
<b>Site 06</b>													
M06-06	Water	X	--	--	X	--	--	X	X	X	X	X	X
<b>Site 07</b>													
M07A-09	Water	X	--	--	X	--	--	X	X	X	X	X	X
D07A-02	Water	X	--	--	X	--	--	X	X	X	X	X	X
M07A-03	Water	X	--	--	X	X	X	X	X	X	X	X	X
W1	Water	X	--	--	X	X	X	X	X	X	X	X	X
W1*	Water	X	--	--	X	X	X	X	X	X	X	X	X
M07A-04	Water	X	--	--	X	X	X	X	X	X	X	X	X
<b>Site 09</b>													
M09-06	Water	X	--	--	X	--	--	X	X	X	X	X	X
M09-06*	Water	X	--	--	X	--	--	X	X	X	X	X	X
D09-01	Water	X	--	--	X	--	--	X	X	X	X	X	X
<b>Site 10</b>													
M10-01	Water	X	--	--	X	--	--	X	X	X	X	X	X
<b>Site 11</b>													
M11-01	Water	X	--	--	X	--	--	X	X	X	X	X	X
M11-02	Water	X	--	--	X	--	--	X	X	X	X	X	X
M11-02*	Water	X	--	--	X	--	--	X	X	X	X	X	X
M11-05	Water	X	--	--	X	--	--	X	X	X	X	X	X

TABLE 3-1

**PROPOSED GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 4 of 5)

Well Number/ QC Sample	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 11 (Continued)</b>													
M11-06	Water	X	—	—	X	—	—	X	X	X	X	X	X
<b>Site 12</b>													
M12-01	Water	X	—	—	X	—	—	X	X	X	X	X	X
<b>Site 13</b>													
M13-06	Water	X	X	—	X	X	X	X	X	X	X	X	X
M13-09	Water	X	—	—	X	X	X	X	X	X	X	X	X
MW0R-5	Water	X	—	—	X	X	X	X	X	X	X	X	X
MW0R-5*	Water	X	—	—	X	X	X	X	X	X	X	X	X
<b>Site 14</b>													
M101-A	Water	X	—	—	X	X	X	X	X	X	X	X	X
<b>Site 16</b>													
M16-04	Water	X	—	—	X	—	—	X	X	X	X	X	X
M16-04*	Water	X	—	—	X	—	—	X	X	X	X	X	X
<b>Site 19</b>													
MWD13-3	Water	X	—	—	X	X	X	X	X	X	X	X	X
<b>Site 21</b>													
M07B-01	Water	X	—	—	X	—	—	X	X	X	X	X	X
<b>Site 22</b>													
M07C-07	Water	X	—	—	X	X	X	X	X	X	X	X	X
M07C-08	Water	X	—	—	X	X	X	X	X	X	X	X	X
D07C-01	Water	X	—	—	X	X	X	X	X	X	X	X	X
MW547-4	Water	X	—	—	X	X	X	X	X	X	X	X	X
<b>Site 23</b>													
D10B-02	Water	X	—	—	X	—	—	X	X	X	X	X	X
M530-2	Water	X	—	—	X	X	X	X	X	X	X	X	X
<b>Background Well</b>													
MBG-3	Water	X	X	X	X	X	X	X	X	X	X	X	X

TABLE 3-1

**PROPOSED GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 5 of 5)

Well Number/ QC Sample	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Off Site Wells</b>													
CW-1	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-2	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-3	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-4	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-5	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-5*	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-6	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-7	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-8	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-9	Water	--	--	--	X	--	--	X	X	X	X	X	X
<b>QC Samples - Blanks</b>													
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	Water	X	--	--	--	--	--	--	--	--	--	--	--

**Notes:**

Nitr-N Nitrate/Nitrite as N  
 PCB Polychlorinated biphenyls  
 Pest Pesticides  
 QC Quality control  
 SVOC Semivolatile organic compounds  
 TDS Total dissolved solids

TEPH Total extractable petroleum hydrocarbons  
 TOC Total organic carbon  
 TPPH Total purgable petroleum hydrocarbons  
 VOC Volatile organic compounds  
 X Analysis performed

-- Sample not analyzed for this parameter

\* Duplicate groundwater samples - Note that the specific wells where duplicate samples are collected will be selected in the field by the sampling team. The wells included in this table are examples only.

## REFERENCES

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**APPENDIX A**  
**STANDARD OPERATING PROCEDURES**

## **APPENDIX A CONTENTS**

- SOP No. 002 General Equipment Decontamination
- SOP No. 003 Organic Vapor Air Monitoring
- SOP No. 010 Groundwater Sampling
- SOP No. 011 Field Measurement of Water Temperature
- SOP No. 012 Field Measurement of pH
- SOP No. 013 Field Measurement of Specific Conductance
- SOP No. 016 Sample Preservation and Maximum Holding Times
- SOP No. 017 Sample Collection Container Requirements
- SOP No. 018 Sample Custody
- SOP No. 019 Packaging and Shipping Samples
- SOP No. 024 Recording Notes in the Field Logbook
- SOP No. 065 Colorimetric Indicator Detector

**SOP No. 002 General Equipment Decontamination  
(6 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

**STANDARD OPERATING PROCEDURE**

**GENERAL EQUIPMENT DECONTAMINATION**

**SOP NO. 002**

**REVISION NO. 2**

Approved by:

Daniel Ashenberg  
Quality Assurance Officer

2/2/93  
Date

Date of Original Issue: 03/31/91

Title: **General Equipment Decontamination**

---

## **1.0 BACKGROUND**

All non-disposable sampling equipment must be cleaned before and after each use at each sampling location to obtain representative samples and to reduce the possibility of cross-contamination.

### **1.1 PURPOSE**

This standard operating procedure (SOP) establishes the requirements and procedure for decontaminating general equipment in the field.

### **1.2 SCOPE**

This SOP applies to decontaminating general non-disposable equipment. To prevent contamination of samples, all sampling equipment must be thoroughly cleaned prior to each use.

### **1.3 DEFINITIONS**

**Alconox** -- a nonphosphate soap.

### **1.4 REFERENCES**

U.S. Environmental Protection Agency, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, pages 106-107.

### **1.5 REQUIREMENTS AND RESOURCES**

The equipment required to conduct the decontamination procedure is as follows:

---

**Title: General Equipment Decontamination**

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- ! Scrub brushes
- ! Large wash tubs or buckets
- ! Alconox
- ! Tap water
- ! Distilled water
- ! Plastic sheeting
- ! Aluminum foil
- ! Methanol or hexane

## **2.0 PROCEDURE**

This procedure applies to decontaminating all drilling and non-disposable equipment.

### **2.1 DECONTAMINATING PERSONNEL EQUIPMENT**

Personnel working in the field are required to follow specific procedures for decontamination prior to leaving the work area so that contamination is not spread off-site or to clean areas. All used disposable protective clothing, such as Tyvek coveralls, gloves, and booties, will be containerized for later disposal. Decontamination water will be containerized in 55-gallon drums.

Personnel decontamination procedures will be as follows:

- 1) Wash neoprene boots (or neoprene boots with disposable booties) with Liquinox or Alconox solution and rinse with clean water. Remove booties and retain boots for subsequent reuse.
- 2) Wash outer gloves in Liquinox or Alconox solution and rinse in clean water. Remove outer gloves and place into plastic bag for disposal.
- 3) Remove Tyvek or coveralls. Containerize Tyvek for disposal and place coveralls in plastic bag for reuse.

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- 4) Remove air purifying respirator (APR), if used, and place the spent filters into a plastic bag for disposal. Filters should be changed daily or sooner depending on use and application. Place respirator into a separate plastic bag after cleaning and disinfecting.
- 5) Remove disposable gloves and place them in plastic bag for disposal.
- 6) Thoroughly wash hands and face in clean water and soap.

## **2.2 DECONTAMINATING DRILLING AND MONITORING WELL INSTALLATION EQUIPMENT**

All drilling equipment should be decontaminated at a designated location on-site before drilling operations begin, between borings, and at completion of the project.

Monitoring well casing, screens, and fittings are assumed to be delivered to the site in a clean condition. However, they should be steam cleaned on-site prior to placement downhole. The drilling subcontractor will furnish the steam cleaner and water.

After cleaning the drilling equipment, field personnel should place the drilling equipment, well casing and screens, and any other equipment that will go into the hole on clean polyethylene sheeting.

The drilling auger, bits, drill pipe, temporary casing, surface casing, and other equipment should be decontaminated by the drilling subcontractor by hosing down with a steam cleaner until thoroughly clean. Drill bits and tools that still exhibit particles of soil after the first washing should be scrubbed with a wire brush and then rinsed again with a high-pressure steam rinse.

All wastewater from decontamination procedures should be containerized.

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### **2.3 DECONTAMINATING BOREHOLE SOIL SAMPLING EQUIPMENT**

The soil sampling equipment should be decontaminated after each sample as follows:

- 1) Prior to sampling, scrub the split-barrel sampler and sampling tools in a bucket using a stiff, long bristle brush and Liquinox or Alconox solution.
- 2) Steam clean the sampling equipment over the rinse tub and allow to air dry.
- 3) Place cleaned equipment in a clean area on plastic sheeting and wrap with aluminum foil.
- 4) Containerize all water and rinseate.
- 5) Decontaminate all pipe placed down the hole as described for drilling equipment.

### **2.4 DECONTAMINATING WATER LEVEL MEASUREMENT EQUIPMENT**

Field personnel should decontaminate the well sounder and interface probe before inserting and after removing them from each well. The following decontamination procedures should be used:

- 1) Wipe the sounding cable with a disposable soap-impregnated cloth or paper towel.
- 2) Rinse with deionized organic-free water.

### **2.5 GENERAL SAMPLING EQUIPMENT DECONTAMINATION**

All non-disposable sampling equipment must be decontaminated using the following procedure:

- 1) Select an area removed from sampling locations that is both downwind and

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downgradient. Decontamination must not cause cross-contamination between sampling points.

- 2) Maintain the same level of protection as was used for sampling.
- 3) To decontaminate a piece of equipment, use analconox wash; a tap water wash; a solvent (methanol or hexane) rinse, if applicable or dilute (0.1 N) nitric acid rinse, if applicable; a distilled water rinse; and air drying. Use a solvent (methanol or hexane) rinse for grossly contaminated equipment (for example, equipment that is not readily cleaned by thealconox wash). The dilute nitric acid rinse may be used if metals are the analyte of concern.
- 4) Place cleaned equipment in a clean area on plastic sheeting and wrap with aluminum foil.
- 5) Containerize all water and rinsate.

**SOP No. 003 Organic Vapor Air Monitoring  
(9 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

**STANDARD OPERATING PROCEDURE**

**ORGANIC VAPOR AIR MONITORING**

**SOP NO. 003**

**REVISION NO. 0**

Approved by:

*Ronald Presing*  
Quality Assurance Officer

4/8/94  
Date

## **1.0 BACKGROUND**

Exposure to airborne organic contaminants can present a significant threat to worker health and safety. Thus, identification and quantification of these contaminants through air monitoring is essential for reconnaissance activities. Reliable measurement of airborne contaminants is useful for selecting personal protective equipment, delineating areas where protection is needed, assessing the potential health effects of exposure and determining the need for specific medical monitoring.

### **1.1 PURPOSE**

This SOP discusses the factors that are considered when conducting air monitoring.

### **1.2 SCOPE**

Strategies for assessing airborne contamination and the instruments (Organic Vapor Analyzer (OVA®) and the HNu® Photoionization Detector) will be discussed.

### **1.3 DEFINITIONS**

**Flame Ionization** -- A process involving ionization of sample gas with a flame leading to a quantifiable count of carbon atoms.

**HNu® Photoionization 101, Trace Gas Analyzer** -- A portable instrument used to detect, measure, and provide a direct reading of the concentration of a variety of trace organic gases in many industrial or plant-type atmospheres. The principle methods of detection is photoionization.

**Ionization Potential** -- The amount of energy needed to strip an electron from the orbit of its resident molecules, expressed in electron volts (eV).

**Organic Vapor** -- Airborne compounds composed of carbon, hydrogen, and other elements with chain or ring structures.

**Organic Vapor Analyzer (OVA®)** -- A portable instrument used to detect, measure, and provide a direct reading of the concentration of a variety of trace organic gases in many industrial or plant-type atmospheres. The principle method of detection is flame ionization.

**Photoionization** -- A process involving the absorption of ultra-violet light by a gaseous molecule leading to ionization.

#### **1.4 REFERENCES**

NIOSH/OSHA/USCG/EPA, 1985, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, U.S. Government Printing Office, Washington, DC.

#### **1.5 REQUIREMENTS AND RESOURCES**

The equipment required to conduct direct reading air monitoring of airborne organic compounds will be limited to the HNu® photoionization detector and the Foxboro organic vapor analyzer (OVA). Other equipment is available to conduct similar monitoring. Calibration gas will also be required.

### **2.0 PROCEDURES**

#### **2.1 DIRECT-READING INSTRUMENT CONSTRAINTS**

All direct-reading instruments have inherent constraints in their ability to detect gaseous organic compounds. They usually detect and/or measure only specific classes of chemicals. Generally, they are not designed to measure and/or detect airborne concentrations below 1 ppm. Finally, many direct reading instruments that have been designed to detect one particular substance also detect other substances (interference) and consequently may give false readings.

## **2.2 ACCURATE RECORDING AND INTERPRETATION**

It is imperative that direct-reading airborne organic compound instrumentation be operated, and their data interpreted by qualified individuals who are knowledgeable in the instruments operating principles and limitations. At hazardous waste sites, where unknown and multiple contaminants are frequently encountered, instrument readings should be interpreted conservatively.

The following are guidelines to facilitate accurate recording and interpretation.

Calibrate instruments according to the manufacturer's instructions, before and after every use.

The instrument's readings have limited value where contaminants are unknown. When recording readings of unknown contaminants, report them as "X" instrument units or "positive response" rather than specific concentrations (i.e., ppm).

Conduct additional monitoring at any location where a positive response occurs.

A reading of zero should be reported as "non-detectable" (ND) rather than viewed as clean. Quantities of chemicals may be present, but not detectable by the instrument.

The air monitoring survey should be repeated by other detection devices.

## **2.3 HNu® PHOTOIONIZATION SYSTEM**

### **2.3.1 Application**

The HNu® photoionization detector can detect total concentrations of many organic and some inorganic gases and vapors. Some identification of compounds is possible if more than one probe is used.

### **2.3.2 Detection Method**

The HNu® ionizes molecules using UV radiation. Ionization in this manner strips electrons from the molecules that produce a current that is proportional to the number of ions.

### **2.3.3 Limitations**

The HNu® does not:

1. detect methane
2. detect a compound if the probe used has a lower energy level than the compound's ionization potential
3. respond accurately when there is a mixture of gases or vapors

4. respond accurately in high humidity or very cold weather
5. respond accurately when there is interference with other current sources

#### **2.3.4 Ease of Operation**

The effective use of the HNu® requires that the operator understand the operating principles and procedures, and be competent in calibration, reading, and interpreting the instrument.

#### **2.3.5 General Care and Maintenance**

The HNu® will need to be recharged or have its battery replaced. The lamp window (in probe) must be cleaned regularly. The instrument and its accessories must also be regularly cleaned and maintained.

#### **2.3.6 Typical Operating Times**

The HNu will run continuously for 10 hours on a charged battery; 5 hours with a strip chart recorder.

### **2.4 FOXBORO ORGANIC VAPOR ANALYZER (OVA) SYSTEM**

#### **2.4.1 Application**

In the survey mode, the OVA detects the total concentration of many organic gases and vapors. In gas chromatography (GC) mode, the OVA identifies and measures specific compounds.

In the survey mode, all organic compounds are ionized and detected at the same time. In GC mode, volatile species are separated.

#### **2.4.2 Detection Method**

Organic gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present.

#### **2.4.3 Limitations**

The OVA does not detect inorganic gases and vapors, or some synthetics. Sensitivity depends on the compounds.

The OVA should not be used at temperatures less than 40° F (4° C).

It is difficult to absolutely identify compounds with the OVA.

High concentrations of contaminants or oxygen-deficient atmospheres require system modifications.

In the survey mode, readings can be only reported relative to the calibration standard used, i.e., methane equivalents.

#### **2.4.4 Ease of Operation**

Use of the OVA requires experience to interpret data correctly, especially in the GC mode.

Specific identification requires calibration with the specific analyte of interest.

#### **2.4.5 General Ease and Maintenance**

The OVA battery must be recharged or replaced, as needed.

The hydrogen fuel supply must be monitored during use to maintain an adequate supply.

OVA user should perform routine maintenance as described in its operation manual.

The OVA should be routinely checked for leaks.

#### **2.4.6 Typical Operating Time**

The OVA can typically run for 8 hours on a fully charged battery; 3 hours with a strip chart recorder.

### **3.0 VARIABLES AFFECTING OUTDOOR AIR MONITORING**

Complex, multisubstance environments such as those associated with hazardous waste sites pose significant challenges to accurately and safely assess airborne contaminants. Several independent and uncontrollable variables, most notably temperature and weather conditions, can affect airborne concentrations. These factors must be considered when conducting air monitoring and interpreting data. The following are environmental variables that must be considered.

#### **3.1 TEMPERATURE**

An increase in temperature increases the vapor pressure of most chemicals.

#### **3.2 WINDSPEED**

An increase in windspeed can affect vapor concentration near a free-standing liquid surface. Dust and particulate-bound contaminants are also affected.

### **3.3 RAINFALL**

Water from rainfall can essentially cap or plug vapor emission routes from open or closed containers, saturated soil, or lagoons, thereby reducing airborne emissions of certain substances.

### **3.4 MOISTURE**

Dusts, including finely divided hazardous solids, are highly sensitive to moisture content. This moisture content can vary significantly with respect to location and time and can also affect the accuracy of many sampling results.

### **3.5 VAPOR EMISSIONS**

The physical displacement of saturated vapors can produce short-term, relatively high vapor concentrations. Continuing evaporation and/or diffusion may produce long-term vapor concentrations and may involve large areas.

### **3.6 WORK ACTIVITIES**

Work activities often require the mechanical disturbance of contaminant materials, which may change the concentration and composition of airborne contaminants, as well as contribute to airborne emissions from gasoline or diesel engine emissions.

**SOP No. 010 Groundwater Sampling  
(15 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

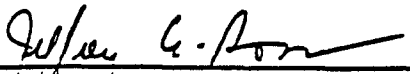
**STANDARD OPERATING PROCEDURE**

**GROUNDWATER SAMPLING**

**SOP NO. 010**

**REVISION NO. 3**

Approved by:

  
\_\_\_\_\_  
Quality Assurance Officer

2/19/93  
\_\_\_\_\_  
Date

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**Title: Groundwater Sampling**

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## **1.0 BACKGROUND**

Groundwater sampling may be required for a variety of reasons, such as examining potable or industrial water supplies, checking for and tracking contaminant plume movement in the vicinity of a land disposal or spill site, RCRA compliance monitoring, or examining a site where historical information is minimal or nonexistent, but where it is thought groundwater may be contaminated.

Groundwater is usually sampled through an in-place well, either temporarily or permanently installed. However, it can also be sampled anywhere groundwater is present, such as a pit or a dug or drilled hole.

Occasionally, a well will not be in the preferred location to obtain the sample needed (for example, to track a contaminant plume). In such a case, a temporary or permanent well will have to be installed. An experienced and knowledgeable person, preferably a hydrogeologist, will need to locate the well and supervise its installation so that the samples ultimately collected will be representative of the groundwater.

### **1.1 PURPOSE**

This standard operating procedure (SOP) establishes the requirements and procedure for determining the quality of groundwater entering, leaving, or affected by site activities through groundwater sampling. The samples are obtained by retrieving water from a well placed into the underlying aquifer or aquifers at a site.

### **1.2 SCOPE**

This SOP applies to all groundwater sampling activities conducted in the field.

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### 1.3 DEFINITIONS

**Bailer** -- A cylindrical sampling device with valves on either end used to extract water from a well. Bailers are usually constructed of an inert material such as stainless steel or polytetrafluoroethylene (Teflon). The bailer is lowered and raised by means of a cable that may be cleaned and reused, or by disposable rope.

**Electrical Water Level Indicator** -- An electrical device that has a light or sound alarm connected to an open circuit used to determine the depth to fluid. The circuit is closed when the probe intersects a conducting fluid. The wire used to raise and lower the probe is usually graduated.

**Immiscible Phase** -- Liquid phases that cannot be uniformly mixed or blended with water. Heavy immiscible phases sink; light immiscible phases float on water.

**Interface Probe** -- An electrical probe that determines the distance from the surface to air/water, air/immiscible, or immiscible/water interfaces.

**Purge Volume** -- The volume of water that needs to be removed from the well to insure that a sample representative of the groundwater is taken.

**Riser Pipe** -- The length of well casing above the ground surface.

**Total Well Depth** -- The distance from the ground surface to the bottom of the well.

**Water Level** -- The level of water in a well. Measured as depth to water or as elevation of water, relative to a reference mark or datum.

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#### 1.4 REFERENCES

Korte, N. P. Kearl, Procedures for the Collection and Preservation of Groundwater and Surface Water Samples and for the Installation of Monitoring Wells: Second Edition, GJ/TMC-08, U.S. Department of Energy, Technical Measurements Center, Grand Junction Projects Office, 1985.

U.S. EPA, "Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities," EPA-530/SW-611, August 1977.

U.S. EPA, "Sampling at Hazardous Materials Incidents," EPA Hazardous Response Support Division, Cincinnati, 1984.

U.S.G.S., 1984, National Handbook of Recommended Methods for Water-Data Acquisition, Reston, VA.

#### 1.5 REQUIREMENTS AND RESOURCES

There are various options available to obtain groundwater samples. The procedures are outlined in the following section. The equipment needed for these procedures includes:

- Organic vapor detector with a flame ionization detector (FID) or photoionization detector (PID)
- Pipe wrench
- Electrical water level indicator or interface probe
- Steel tape with heavy weight
- Purging device (type needed depends on well depth, casing diameter, type of sample desired - see sampling devices below)
- Sampling device (type needed depends upon depth to water and type of sample desired)
  - Teflon bailer
  - Stainless steel bailer
  - Teflon bladder pump
  - Stainless steel submersible (nonoil-bearing) pump
  - Existing dedicated equipment
  - Peristaltic pump

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- Sample containers
- Wastewater containers with adequate volume
- Logbook
- Stopwatch

Additional equipment is required to complete measurement of field parameters (i.e., pH, specific conductance, and temperature) of the groundwater at the well (refer to SOP No. 061).

## **2.0 PROCEDURE**

Prior to sampling, a site-specific sampling plan will be developed. The plan will take into consideration the site characteristics and will include:

- The specific repeatable well measurement techniques and reference points for determining the depth to water and the depth to bottom of the well
- The specific method of purging and selection of purging equipment
- The specific analytical method for measurement of field parameters and the selection of field analytical equipment
- The specific method of sample collection and selection of sampling equipment
- The order of sample bottle filling
- The sample chemical analytical parameters

### **2.1 APPROACHING THE WELL**

In general, all wells should be assumed to pose a health and safety risk until field measurements determine otherwise. Approach wells from the upwind side. Record well appearance and general condition of the protective casing, surface seal, and surrounding area in the logbook.

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Once at the well, the lead person should systematically use the organic vapor detector to survey the immediate area around the well (from the breathing zone to the top of the casing to the ground). If elevated FID and PID meter readings are encountered, retreat to a safe area and instruct the sampling team to put on the appropriate level of personal protective equipment (PPE).

Upon opening the well casing, the lead person should systematically survey inside the well casing above the well casing in the breathing zone and the immediate area around the well. If elevated FID or PID meter readings in the breathing zone are encountered, (see health and safety plan for action levels) retreat and put on appropriate PPE. It is important to remember that action levels are based on readings in the breathing zone, not within the well casing. Representative organic vapor detector readings will be recorded in the logbook.

## **2.2 ESTABLISHING A SAMPLE PREPARATION AREA**

The sample preparation area is generally located upwind or to either side of the well. If elevated readings are encountered using an organic vapor detector, this area should be taped off and the sample preparation area should be located upwind where ambient readings are found.

## **2.3 PRELIMINARY WELL MEASUREMENTS**

Several preliminary well measurements should be made prior to initiating sampling of the well. These include determining water level and total well depth measurements, determining the presence of immiscible phases, and calculating purge volumes. All preliminary measurements will be recorded in the logbook as they are determined.

### **2.3.1 Water Level and Total Well Depth Measurements**

PRC typically uses an electric water-level indicator for water level measurements. This device sounds an alarm or illuminates a light when the measuring probe touches the water surface, thus closing an electrical circuit. The electric cable supporting the probe is usually graduated in feet and can be read at the well site directly. The remaining fraction is measured with a steel tape graduated to 0.01 foot. The distance between the static water level and the marked or notched

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location at the top of the riser pipe is measured. The height of the riser pipe above ground surface, as obtained from well location survey data, is then subtracted from the total reading to give the depth to static water. To improve the accuracy of the readings, each measurement should be for a series of three readings, and the values averaged. This helps to eliminate any errors from kinks or bends in the wires, which may change the length when the device is pulled up and let down.

The total well depth can be measured by using a steel tape with a heavy weight attached to the end. The tape is lowered into the well until resistance is met, indicating that the weight has reached the bottom of the well. The total well depth is then read directly from the steel tape to the 0.01 foot fraction. The distance between the bottom of the well and the marked or notched location on the riser pipe is measured. The height of the riser pipe above the ground surface, as obtained from well survey data, is then subtracted from the total reading to give the depth to the bottom of the well. To improve the accuracy of the readings, the weighted steel tape should be used to make a series of three readings, and the readings averaged.

### **2.3.2 Determining If Immiscible Phases Are Present**

If immiscible phases (organic floaters or sinkers) are present, the following measurement activities should be undertaken. Organic liquids are measured by lowering an interface probe slowly to the surface of the liquid in the well. When the audible alarm sounds, record the depth. If the alarm is continuous, a floating immiscible layer has been detected. To determine the thickness of this layer, continue lowering the probe until the alarm changes to an oscillating signal. The oscillating signal indicates that the probe has detected an aqueous layer. Record this depth as the depth to water and determine the thickness and the volume of the immiscible layer.

Continue lowering the probe into the well to determine if immiscible dense phases (sinkers) are present. If the alarm signal changes from oscillating to a continuous sound, a heavier immiscible layer has been detected; record this depth.

Continue lowering the probe to the bottom of the well and record the total depth. Separate total depth measurements with a steel tape are not necessary when using an interface

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probe. Calculate and record the sinker-phase volume and total water volume in the well. A chart is provided in Table 1 to assist in these calculations. If immiscible phases are present, immediately refer to Sections 2.5.1 or 2.5.2 of this SOP.

### **2.3.3 Determination of Purging Volume**

If the presence of floaters or sinkers does not need to be determined, determine the depth to water and the total depth of the well as described in Section 2.3.1. Once these measurements have been made and recorded, use Table 1 to calculate the total volume of water in the well. Multiply this volume by the purging factor to determine purging volume. The minimum purging factor is three casing volumes but may be superseded by site-specific program requirements, individual well yield characteristics or stabilization of field parameters measured during purging. Field parameters (i.e., pH, specific conductance, and temperature) should be measured in accordance with SOP No. 061 prior to purging and after each well volume. All field parameter data are recorded in the field logbook.

In Table 1, the volume of water in a 1-foot section of a 2-inch-diameter well is 0.16 gallon. This chart can easily be used for any water depth by multiplying all the values in Table 1 by the L value (depth, in feet, of water in the well).

## **2.4 PURGING THE WELL**

Currently, PRC standards allow for six options for purging wells:

- 1) Teflon bailers
- 2) Stainless steel bailers
- 3) Teflon bladder pumps
- 4) Stainless steel submersible (nonoil-bearing) pumps

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**TABLE 1**  
**LIQUID VOLUME IN A 1-FOOT SECTION OF WELL CASING**

Well Casing Inside Diameter (D) (inches)	Volume of Liquid in 1-Foot well Section (gallons)
	$V = 0.0408 (D^2)$
1	0.041
1.5	0.092
2	0.163
3	0.367
4	0.653

The volume of water in the well is based on the formula:

$$V = \frac{\pi \times D^2}{4} \times L$$

where:

- D = the inside diameter of the well in inches
- L = the depth in feet of the water in the well
- V = the volume of water in the well in cubic feet

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- 5) Existing dedicated equipment (use of these devices must be approved by on-site client representatives)
- 6) Peristaltic pumps (these devices are for use in shallow wells only and must be approved by the on-site client representative)

As previously stated, the established minimum purging volume is three casing volumes. The exception to this standard is in the case of low-yield wells. When purging low-yield wells, purge the well once to dryness. Samples should be collected as soon as the well recovers. When the time required for full recovery exceeds 3 hours, samples should be collected as soon as sufficient volume is available.

The well should be purged until the measured field parameters have been stabilized. If any field parameter has not stabilized, additional purging should be performed. To be considered stable, field parameters should change by no more than the tolerance levels listed on Table 2 between each well volume purged.

**TABLE 2**  
**FIELD MEASUREMENT TOLERANCE LEVELS**

Field Parameter	Tolerance Level
pH	0.1 pH units
Specific Conductance	10% RPD
Temperature	1°C
RPD Relative percent difference	
°C Degrees Celsius	

At no time should the purging rate be high enough to cause the groundwater to cascade back into the well, resulting in excessive aeration and potential stripping of volatile constituents.

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The actual volume of purged water can be measured using several acceptable methods:

- When bailers are used, the actual volume of each bailer's contents can be measured using a calibrated bucket.
- If a pump is used for purging, the pump rate can be determined by using a bucket, stopwatch, and the duration of pumping until the necessary volume is purged.

## 2.5 SAMPLE COLLECTION

The technique used to withdraw a groundwater sample from a well should be selected based on the parameters for which the sample will be analyzed. To ensure that the groundwater samples are representative, it is important to avoid physically altering or chemically contaminating the sample during collection, withdrawal, or containerization. If the samples are to be analyzed for volatile organic compounds, it is critical that air does not become entrained in the water column.

Acceptable sampling devices for all parameters include double check valve stainless steel or Teflon bailers, bladder pumps, low-flow positive displacement pumps, or for shallow wells peristaltic pumps. Additional field measurements should be performed at the time of sampling. Refer to SOP No. 061.

In some cases, it may become necessary to use dedicated equipment already in the well to collect samples. This is particularly true of high volume, deep wells (>150 feet) where bladder pumps are ineffective, and bailing is impractical. If existing equipment must be used, determine the make and model of the pump, and obtain information on component construction materials from the manufacturer or facility representatives. If an existing pump is to be used for sampling, make sure the flow volume can be reduced so that a reliable volatile organics analysis (VOA) sample can be taken. Record which specific port, tap, or valve sample is collected from.

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General sampling procedures include the following:

- Clean sampling equipment should not be placed directly on the ground. Use a plastic drop cloth or feed line from clean reels. Never place contaminated lines back on reels.
- Check the operation of the bailer check valve assemblies to confirm free operation.
- If the bailer cable is to be decontaminated and reused, it must be made of Teflon-coated stainless steel.
- Lower sampling equipment slowly into the well to avoid degassing the water and damaging the equipment.
- Pump flow rates should be adjusted to eliminate intermittent or pulsed flow. The settings should be determined during the purging operations.
- A separate sample volume should be collected to measure field parameters. Samples should be collected and containerized in the order of the parameters' volatilization sensitivity. Table 3 lists the preferred collection order for some common groundwater parameters.

**TABLE 3**  
**ORDER OF PREFERRED SAMPLE COLLECTION**

- 
- |     |                                  |
|-----|----------------------------------|
| 1.  | Volatile organics (VOA)          |
| 2.  | Purgeable organic halogens (POX) |
| 3.  | Total organic halogens (TOX)     |
| 4.  | Cyanide                          |
| 5.  | Extractable organics             |
| 6.  | Purgeable organic carbon (POC)   |
| 7.  | Total metals                     |
| 8.  | Dissolved metals                 |
| 9.  | Total organic carbon (TOC)       |
| 10. | Phenols                          |
| 11. | Sulfate and chloride             |
| 12. | Nitrate and ammonia              |
| 13. | Radionuclides                    |
-

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Intermediate containers should never be used to prepare VOA samples and should be avoided for all parameters in general. All VOA containers should be filled at a single sampling point or from a single bailer volume.

#### **2.5.1 Collection of Light Immiscible Floaters**

The approach used when collecting floaters is dependent on the depth to the floating layer and the thickness of that layer. If the thickness of the floater is 2 feet or greater, a bottom-filling valve bailer should be used. Slowly lower the bailer until contact is made with the floater surface, and lower the bailer to a depth less than that of the floater/water interface depth as determined by preliminary measurements with the interface probe.

When the thickness of the floating layer is less than 2 feet and the depth to the surface of the floating layer is less than 15 feet, a peristaltic pump can be used to extract a sample.

When the thickness of the floating layer, however, is less than 2 feet and the depth to the surface of the floating layer is beyond the effective "lift" of a peristaltic pump (greater than 25 feet), a bailer can be modified to allow filling from the top only (an acceptable alternative is to use a top-loading Teflon or stainless steel bailer). Disassemble the bailer's bottom check valve and insert a piece of 2-inch-diameter Teflon sheet between the ball and ball seat. This will seal off the bottom valve. Remove the ball from the top check valve, thus allowing the sample to enter from the top. To overcome buoyancy when the bailer is lowered into the floater, place a length of one-inch stainless steel pipe on the retrieval line above the bailer (this pipe may have to be notched to allow sample entry if the pipe remains within the top of the bailer). Or, as an alternative, use a top-loading stainless steel bailer. Lower the device, carefully measuring the depth to the surface of the floating layer, until the top of the bailer is level with the top of the floating layer. Lower the bailer an additional one-half thickness of the floating layer and collect sample. This technique is the most effective method of collection if the floating layer is of only a few inches thick.

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### **2.5.2 Collection of Heavy Immiscible Sinkers**

The best method for collection of sinkers is use of a double check valve bailer. The key to collection is slow, controlled, lowering and raising of the bailer to and from the bottom of the well. Collection methods are equivalent to those described in Section 2.5.1 above. Note that both floaters and sinkers must be collected prior to any purging activities.

### **2.5.3 Collection of Volatile Organics Samples**

This section discusses the collection of VOAs using either a bailer or bladder pump in detail. Other pumps (such as positive displacement or peristaltic) can be used. Critical to the collection of representative samples for volatile organics analysis are ensuring that no air has become entrained in the water column, low pump flow rates (less than 100 milliliter (mL) per minute, if possible), and avoiding flow surges.

#### **2.5.3.1 Collection with Bailers**

VOAs should be collected from the first bailer removed from the well after purging. The most effective means requires two people. One person should retrieve the bailer from the well and pour its contents into the appropriate number of 40-mL VOA vials held by the second person. Cap the vial and invert. If a bubble exists, discard and repeat. Do not reopen the vial and add additional sample. The sample is transferred from the bailer to the container in a manner that will limit the amount of agitation in order to reduce the loss of volatile organics from the sample.

Always fill VOA vials from a single bailer volume. If the bailer is refilled, samples are not duplicates or splits.

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#### 2.5.3.2 Collection with a Bladder Pump (Well Wizard)

To successfully perform VOA sampling with a Well Wizard bladder pump, the following steps must be completed:

- 1) Following manufacturer's directions, activate the Well Wizard pump. Full water flow from the discharge tubing will begin after 5 to 15 pumping cycles. These initial pumping cycles are required to purge air from the pump and discharge tubing. The discharge and recharge settings must be manually set and adjusted to pump at optimum flow rates. To activate the bladder, it is best to set the initial cycle at long discharge and recharge rates.
- 2) Reduce water flow rate for VOA sample collection. To reduce the water flow rate, turn the throttle control valve (located on the left side of the Well Wizard pump control panel) counterclockwise.
- 3) Collect VOA sample from discharge tubing. VOA vials must be placed beneath the discharge tubing while avoiding direct contact between the vials and the tubing. Never place tubing past the mouth of the VOA vial. The pump throttle control must be turned as necessary to maintain a trickle of water in order to obtain a meniscus in the vial.
- 4) Continue with non-VOA sampling. Increase pump flow rate by turning the throttle control knob clockwise.

**SOP No. 011 Field Measurement of Water Temperature  
(4 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

**STANDARD OPERATING PROCEDURE**

**FIELD MEASUREMENT OF WATER TEMPERATURE**

**SOP NO. 011**

**REVISION NO. 2**

Approved by:

Kathleen Homer  
Quality Assurance Officer

5/11/93  
Date

**Title: Field Measurement of Water Temperature**

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## **1.0 BACKGROUND**

Temperature readings are used in the calculation of various forms of alkalinity, in studies of saturation and stability with respect to calcium carbonate, in the calculation of salinity, and in general laboratory operations.

### **1.1 PURPOSE**

This standard operating procedure (SOP) establishes the requirements and procedures for measuring water temperature in the field.

### **1.2 SCOPE**

This SOP applies to measuring the temperature of surface and ground water while in the field.

### **1.3 DEFINITIONS**

National Institute of Standards and Technology Certified Thermometer--a thermometer that carries certification of its temperature reading precision.

### **1.4 REFERENCES**

U.S. Environmental Protection Agency. RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, September 1986.

### **1.5 REQUIREMENTS AND RESOURCES**

The following equipment may be required for field measurement of water temperature:

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Title: **Field Measurement of Water Temperature**

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- ✍ Mercury-filled thermometer with metal case
- ✍ Electronic thermistor with accuracy to 0.1 °C
- ✍ National Institute of Standards Technology Certified Thermometer (for periodic calibration)
- ✍ Container
- ✍ Decontamination materials
- ✍ Field logbook

## **2.0 PROCEDURES**

Under normal conditions, temperature measurements may be made with any reliable, glass, mercury-filled celsius thermometer. At a minimum, the thermometer should have a scale marked for every 0.1 ° or 0.2 °C, with markings etched on the capillary glass. The thermometer should have a minimal thermal capacity to permit rapid equilibration. The thermometer should be calibrated periodically against a precision thermometer certified by the National Institute of Standards and Technology. A certified thermometer is located in PRC Environmental Management, Inc.'s (PRC's) Chicago office. For field operations, use a thermometer that has metal case to prevent breakage.

Alternatively, temperature measurements may be made with a digital electronic thermistor, reading to 0.1 °C. Maintain the thermistor as described in its operation and maintenance manual. In particular, always check the battery before each use. If an extremely long probe is required, follow the manufacturer's directions to insure that unbalanced resistance does not distort readings.

Temperature measurements should be taken at the source. If it is not possible to measure the temperature at the source, use an intermediate container. When an intermediate container is used, fill the container with sample and allow the container temperature to equilibrate with that of the sample source. Dispose of the sample and draw a new sample. Transfer the sample to the equilibrated container and measure its temperature.

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**Title: Field Measurement of Water Temperature**

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Make readings with the thermometer or probe immersed in water long enough to permit complete equilibration. Depending on the type of thermometer, immerse to mark or immerse totally. Report results to the nearest 0.1 °C or 1.0 °C, depending on the testing specifications.

Record measurements in the field logbook or on a specially designated form surface field sheet or as specified in the work plan.

**SOP No. 012 Field Measurement of pH**  
**(8 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

**STANDARD OPERATING PROCEDURE**

**FIELD MEASUREMENT OF pH**

**SOP NO. 012**

**REVISION NO. 3**

Approved by:

Kathleen Hamer  
Quality Assurance Officer

5/18/93  
Date

Date of Original Issue: 03/31/91

Title: **Field Measurement of pH**

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## **1.0 BACKGROUND**

Determining pH is critical for predicting and interpreting the reactions and migration of dissolved chemical constituents in ground or surface water. The pH of ground or surface water must be determined when a sample is collected in the field.

### **1.1 PURPOSE**

This standard operating procedure (SOP) establishes the requirements and procedures for measuring the pH of water samples in the field.

### **1.2 SCOPE**

This SOP applies to the use of pH meters in the field.

### **1.3 DEFINITIONS**

**pH Electrode** -- An electrode that measures the hydrogen ion potential of a solution by comparing it to a standard solution with a known hydrogen ion potential. A thin glass membrane functions as a cation exchange surface. When the electric potential of the interior of the glass membrane is compared to the electric potential of a standard solution kept isolated from the environment, a quantitative determination of the change in the internal solution's electric potential, induced by the external solution, can be made.

**Nernst Potential** -- Nernst Potential is observed when the glass membrane separates the external solution from the internal solution. This is expressed in the following equation:

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$$E = \frac{RT}{F} \ln \frac{[H^+]_{int}}{[H^+]_{ex}}$$

where E = Voltage

R = Gas constant

T = Absolute temperature

F = Faraday constant

$[H^+]_{int}$  = Concentration of hydrogen ion (internal)

$[H^+]_{ex}$  = Concentration of hydrogen ion (external)

Because  $[H^+]_{int}$  is constant, the changes in Nernst Potential are due to the changes in the external solution.

**Buffer Solution** -- A buffer solution is capable of maintaining the relative concentrations of acids and bases by neutralizing, within limits, added acids or bases. It has a known pH for a specific temperature range.

#### 1.4 REFERENCES

None.

#### 1.5 REQUIREMENTS AND RESOURCES

The pH meters used in remedial action programs should have temperature and slope adjustments and a repeatability of  $\leq 0.01$  standard pH unit. Meters used for pH field measurement

**Title: Field Measurement of pH**

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should be of rugged construction. A foam-lined carrying case is convenient both for transport and for use as a work table. Battery-operated meters with easily replaceable or rechargeable batteries are required. Also, a spare pH electrode should be available in the field. Both the spare and working electrodes should be immersed in a pH 4 or pH 7 buffer solution when not in use.

The following are recommended for field measurement of pH:

- ✍ pH meter with repeatability of  $\leq 0.01$  standard pH unit
- ✍ Buffer solutions of pH 4, 7, and 10
- ✍ Combination pH electrode
- ✍ Reference electrode filling solution
- ✍ Electrode holder
- ✍ Thermometer
- ✍ Deionized water and wash bottle
- ✍ Disposable beakers

## **2.0 PROCEDURES**

Meter calibration and field measurement procedures are outlined in the following subsections.

### **2.1 CALIBRATION**

Commercially prepared buffer solutions should be used for calibration. Solutions traceable to the National Bureau of Standards can be purchased inexpensively from any major laboratory supply house. These solutions are certified with an accuracy of  $\leq 0.01$  pH unit at a specific temperature, usually 25°C. Theoretically, buffer solutions are stable indefinitely. However, they are susceptible to contamination, and old, partially full bottles should be replaced.

Because various terms are used to describe the pH meter calibration process, providing a

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detailed set of instructions for each type of instrument is not practical. Always refer to those instructions when using the instrument. The user must be familiar with the manufacturer's instructions for a particular instrument. The following general procedure should be used to calibrate any pH meter:

- 1) Calibrate the meter with two buffer solutions to determine if the electrodes are in working order. The slope cannot be adjusted with a one-point calibration.
- 2) To calibrate the meter, use one buffer solution with a pH greater and one buffer solution with a pH less than the anticipated pH of the sample. For example, for an anticipated pH of 6, calibrate with pH 4 and pH 7 buffers; for an anticipated pH of 8, calibrate with pH 7 and pH 10 buffers.
- 3) Ensure that the buffers are at the same temperature as the sample. Pour aliquots into small containers; never put the electrode into the buffer storage bottles.
- 4) Adjust the instrument to read the pH 7 buffer accurately. Adjust the temperature compensator according to the manufacturer's instructions. Be sure to rinse the probe with deionized water after taking the calibration measurement.
- 5) Adjust the instrument to read the second buffer. Adjust the slope to obtain the correct reading. If the slope deviates greatly from its theoretical value, check for a defective electrode or contaminated buffer solution.
- 6) The meter must be calibrated before the start of work each day. Check calibration periodically and recalibrate if necessary.

## **2.2 FIELD MEASUREMENT**

Do not filter field samples prior to analysis. To minimize the release of gas from a sample, use a submersible pump or bladder pump to obtain ground-water samples.

### **Procedure**

The following procedure should be used for field measurement of pH:

**Title: Field Measurement of pH**

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- 1) Calibrate the instrument according to the manufacturer's instructions. Set the temperature compensation according to procedures provided in Section 2.1.
- 2) Collect sample in a pre-rinsed jar or beaker or a flow-through cell.
- 3) Measure the temperature of the sample to the nearest 1.0°C.
- 4) Set the temperature compensation to the temperature of the sample.
- 5) Rinse the electrode with deionized water.
- 6) Immerse the electrode in the solution. Record the value. If the sample is being pumped through a closed container, wait for the temperature and pH to stabilize. Stop sample flow to prevent the streaming potential. Record the pH.
- 7) Record measurements in log book or forms as specified in the work plan.

### **3.0 POTENTIAL PROBLEMS**

Temperature, atmospheric contamination, and ionic strength are factors that may affect pH measurements. Color, turbidity, and colloids will not affect pH measurements.

**Temperature:** The temperature compensation on a pH meter only permits adjustments of the electrode slope. It does not compensate for changes in the potential of the reference electrode, the asymmetry potential of the glass electrode, or the liquid junction potential. Nor does it compensate for changes in pH because of temperature. Table 1 demonstrates the effect of temperature on pH. The temperatures of the buffer and the unknown liquid must be recorded at the time of measurement. Ideally, their temperatures will be within 2°C of each other.

Title: Field Measurement of pH

**TABLE 1**  
**pH OF BUFFER SOLUTIONS AS A FUNCTION OF TEMPERATURE**

<u>Temperature (°C)</u>	<u>Buffer Values</u>		
<u>Standard</u>	<u>4.0</u>	<u>7.0</u>	<u>10.0</u>
0	4.01	7.13	10.34
5	3.99	7.10	10.26
10	4.00	7.07	10.19
15	3.99	7.05	10.12
20	4.00	7.02	10.06
25	4.00	7.00	10.00
30	4.01	6.99	9.94

**Atmospheric Contamination:** Atmospheric contamination can be a significant problem in ground-water sampling. Dissolved oxygen and carbon dioxide can be evolved or dissolved when the sample is exposed to air, and a considerable change in pH may result. For best results, a ground-water sample is pumped through a closed container in which pH and temperature probes are immersed. The measurements are not recorded until both temperature and pH have stabilized. The sampling pump should be stopped before recording the data because a streaming potential results with flowing sample.

**Ionic Strength:** Because of errors due to ionic strength, which are not worth correcting in the field, pH measurement should be accompanied by measurement of specific conductance. pH is a measure of hydrogen ion activity. Normally, the ground-water sample is assumed to be an ideal solution in which other ions do not affect hydrogen ion activity. However, if the ionic strength is too high, this assumption does not hold true. Some remedial action investigations include sampling of waste ponds or other highly contaminated water. Because buffer solutions used in the field are not made with a similar concentration of dissolved ions, pH measurement of highly contaminated water

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will be inaccurate. Similarly, pH measurement of a sample with very low ionic strength will be inaccurate because the resistance of the sample approaches that of the glass electrode. For best results, samples with very low ionic strength should be stirred for a few seconds before taking a reading. Even then, several minutes may be required for the reading to stabilize. High sodium concentration and alkalinity may also produce errors in pH measurement. For a pH greater than 9 and a sodium concentration greater than 10 moles per liter, a special electrode is needed. It can be purchased from any of the principal electrode manufacturers. Similarly, pH values less than 1 or greater than 9 will have greater uncertainty associated with them because the electrode response is non-Nernstian at these levels.

**SOP No. 013 Field Measurement of Specific Conductance  
(7 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

**STANDARD OPERATING PROCEDURE**

**FIELD MEASUREMENT OF SPECIFIC CONDUCTANCE**

**SOP NO. 013**

**REVISION NO. 2**

Approved by:

Kathleen Horner  
Quality Assurance Officer

5/18/13  
Date

## **1.0 BACKGROUND**

Specific conductance is a widely used parameter for evaluating groundwater and surface water quality. It is a simple indicator of change within a system and provides useful information to laboratory personnel performing other measurements on a water sample.

### **1.1 PURPOSE**

Specific conductance should be determined at the time the sample is collected. This standard operating procedure (SOP) establishes the requirements and procedures for measuring specific conductance in groundwater or surface water while in the field.

### **1.2 SCOPE**

This SOP applies to the use of specific conductance meters in the field.

### **1.3 DEFINITIONS**

**Specific Conductance:** Specific conductance is the reciprocal of electrical resistivity. The values of electrical resistivity and specific conductance depend on the number of ions in a solution. Pure water has 100 percent resistivity and no specific conductance. As ions are added to a solution, resistivity drops and specific conductance increases.

### **1.4 REFERENCES**

U.S. Environmental Protection Agency. November 1986. "Test Methods for Evaluating Solid Waste, Volume 1C: Laboratory Manual Physical/Chemical Methods, SW-846."

American Society for Testing and Materials Annual Book of Standards. "Standard Test Methods for Electrical Conductivity and Resistivity of Water, Method D-1125."

U.S. Geological Survey. 1977. (*National Handbook of Recommended Methods for Water Data Acquisition*).

## 1.5 REQUIREMENTS AND RESOURCES

Specific conductance meters should measure temperature, have a temperature compensator, and read directly in micromhos per centimeter ( $\mu\text{mhos/cm}$ ), corrected to 25 °C. For field measurements, a probe-type unit is preferred over a pipet-type unit. Specific conductance meters should have a foam-lined carrying case and should be battery-operated with easily rechargeable or replaceable batteries. A relative accuracy of plus or minus 3 percent is adequate.

The following are required for calibrating a specific conductance meter and for the field measurement of specific conductance:

- A probe-type specific conductance meter meeting the requirements given above
- Deionized water and wash bottle
- Disposable beakers
- Reagent-grade potassium chloride (KCl) or a commercially-prepared standard 0.01 mole (M) per liter KCl solution
- Sampling containers
- Sampling equipment
- One-liter mixing container
- A thermometer calibrated according to SOP No. 011, "Field Measurement of Water Temperature"
- Logbook

## 2.0 PROCEDURES

Meter calibration and field measurement procedures are outlined in the following subsections.

### 2.1 METER CALIBRATION

Reagent-grade KCl is the universal standard for calibrating specific conductance equipment. The electrodes are calibrated by reading the specific conductance of standard KCl solutions. A concentration of 0.01 M KCl should be used because its specific conductance is closest to that of most natural samples.

The measuring circuit of the specific conductance meter is calibrated either by the manufacturer or with a calibrating resistor. The manufacturer's instructions for the particular instrument should be followed for calibration.

Individual manufacturers may use slightly different terminology, but the following general procedure will always apply:

1. Prepare a 0.01 M KCl solution by dissolving 0.745 gram of pure, dry KCl in 1 liter of deionized water. The base conductivity for the prepared solution is 1,408.1  $\mu\text{mhos/cm}$  at 25 °C; if the deionized water has any conductance, it must be corrected to 25 °C and added to the value of the solution. Alternatively, commercially prepared solutions can be used.
2. Measure the temperatures of the 0.01 M KCl solution and the deionized water used for the dilution. They should be at the same temperature.
3. Using Table 1, determine the expected specific conductance of the 0.01M KCl solution at the temperature measured.
4. Measure the specific conductance of the 0.01M KCl solution and of the deionized water.

**TABLE 1**  
**RELATIONSHIP OF TEMPERATURE AND SPECIFIC CONDUCTANCE**  
**FOR 0.01 M POTASSIUM CHLORIDE**

Temperature (°C).	Expected Specific Conductance of 0.01 M KCl Solution ( $\mu$ mhos/cm).
15 .....	1,141.5
16 .....	1,167.5
17 .....	1,193.6
18 .....	1,219.9
19 .....	1,246.4
20 .....	1,273.0
21 .....	1,299.7
22 .....	1,326.6
23 .....	1,353.6
24 .....	1,380.8
25 .....	1,408.1
26 .....	1,436.5
27 .....	1,463.2
28 .....	1,490.9
29 .....	1,518.7
30 .....	1,546.7

5. Use the following equation to check the cell constant specified by the manufacturer:

$$K = \frac{C_1 + C_2}{10^6 \times C_3}$$

where

- K = the cell constant  
C<sub>1</sub> = the specific conductance of the deionized water  
C<sub>2</sub> = the specific conductance of the 0.01 M KCl solution  
C<sub>3</sub> = is the expected specific conductance from the Table 1

6. A measured cell constant different from that specified by the manufacturer generally indicates that the electrodes are dirty. If this is the case, clean and replatinize the electrodes according to instructions found in the manufacturer's manual or in the American Society for Testing and Materials Method D-1125, Section 8.3
7. After verifying that the cell constant is acceptable, measure the specific conductance of samples according to the procedure given in Section 2.2.

## 2.2 FIELD MEASUREMENT

Do not filter samples before analysis. To minimize gas releases from groundwater samples, a submersible pump or bladder pump should be used to obtain samples.

The following procedure should be used for field measurement of specific conductance:

1. Calibrate the instrument and check the cell constant according to the manufacturer's instructions and the procedure provided in Section 2.1.
2. Collect the sample in a prerinsed jar or beaker or a flow-through cell.
3. Rinse the specific conductance meter probe with deionized water.
4. Using a thermometer or the specific conductance meter itself, measure and record the temperature of the sample in degrees Centigrade. Follow the guidelines in SOP No. 011, "Field Measurement of Water Temperature."

5. Immerse the specific conductance meter probe in the sample. Record the reading in  $\mu\text{mhos/cm}$ .
6. Record measurements in the logbook or as specified in the project work plan.

### 3.0 POTENTIAL PROBLEMS

Principal problem areas for specific conductance measurement are the temperature effect, determination of the cell constant, and allowance for very high ionic strengths. A change in temperature of 10 °C can cause a 20 percent change in the measured specific conductance. Reported data should note whether temperature correction has been applied. Some instruments perform temperature correction automatically, but this, too, should be noted in reported data. To ensure uniformity of readings, all data should be corrected to 25 °C.

Field personnel must be aware that a significant change in the cell constant indicates that the electrodes require cleaning or replatinizing. The constant should be checked at each calibration, as described in Section 2.1.

Specific conductance varies directly with ion concentrations up to a specific conductance of about 5,000  $\mu\text{mhos/cm}$  (*National Handbook of Recommended Methods for Water Data Acquisition 1977*). Samples collected at most sites seldom have a specific conductance greater than 5,000  $\mu\text{mhos/cm}$ . Readings above this level should not be considered accurate. However, such readings can still provide useful information about the relative levels of conductance and should still be noted.

**SOP NO. 016 – SAMPLE PRESERVATION AND  
MAXIMUM HOLDING TIMES**

**FINAL  
GROUNDWATER MONITORING PLAN  
VOLUME IIa – FIELD SAMPLING PLAN**

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SOP NO. 017 – SAMPLE COLLECTION  
CONTAINER REQUIREMENTS

FINAL  
GROUNDWATER MONITORING PLAN  
VOLUME IIa – FIELD SAMPLING PLAN

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**SOP No. 018 Sample Custody  
(27 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC. ~**

**STANDARD OPERATING PROCEDURE**

**SAMPLE CUSTODY**

**SOP NO. 018**

**REVISION NO. 2**

Approved by:

Daniel Ashenberg  
Quality Assurance Officer

2/2/93  
Date

Date of Original Issue: 03/31/91

Title: Sample Custody

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## **1.0 BACKGROUND**

In any sampling and analytical program, the integrity of a sample must be documented from its point of collection to its final disposition. The documentation of the possession and handling of samples is referred to as "chain of custody." The components of this chain, such as sample custody seals, traffic reports, field logbooks, chain-of-custody records, and sample identification tags, and the procedures for their use are described below.

### **1.1 PURPOSE**

This standard operating procedure (SOP) establishes the requirements and procedures for sample custody. It has been prepared in accordance with the U.S. Environmental Protection Agency (EPA)/National Enforcement Investigation Center (NEIC) User's Guide to the EPA Contract Laboratory Program (CLP). Sample custody and documentation procedures described in this SOP should be followed throughout all sample collection activities unless the procedures are revised by EPA. All revisions must be documented in the field logbook.

### **1.2 SCOPE**

This SOP applies to sample custody and the activities associated with it.

### **1.3 DEFINITIONS**

None.

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## **1.4 REFERENCES**

U.S. Environmental Protection Agency, 1988, User's Guide to the EPA Contract Laboratory Program. EPA Office of Emergency and Remedial Response, Washington, D.C.

## **1.5 REQUIREMENTS AND RESOURCES**

Numerous sample identification documents are used to control sample disposition and to maintain a chain-of-custody record for all samples collected. These documents include sample container labels, identification tags, custody seals, chain-of-custody records, and traffic report forms.

## **2.0 PROCEDURES**

The following subsections present detailed instructions for completing chain-of-custody documents, including sample container labels, sample identification tags, custody seals, chain-of-custody records, and traffic reports.

### **2.1 SAMPLE CONTAINER LABELS**

The sample container label is an adhesive label with designated areas to indicate the station location, date and time of sample collection, analysis requested, and preservative added. Before placing the sample material in the appropriate container, the sampler should complete the label with waterproof ink and affix the label to the container. When necessary, the sample label should be protected from water and solvents with clear tape.

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## 2.2 SAMPLE IDENTIFICATION TAGS

Sample identification tags (Figures 1 and 1A) provided by EPA are used to maintain control of laboratory samples. The PRC field team leader should distribute the tags to field team members. The EPA serial numbers should be recorded in the field notebook. Sample tags should be attached to all sample containers used. Unused tags should be returned to the field team leader. Each tag should be completed as follows:


- Space No. 1 should be completed with the case number provided by the CLP laboratory.
- Space No. 2 should be completed with the appropriate sample location number.
- Spaces No. 3A and 3B should be completed with the time and date of sample collection, respectively.
- Space No. 4 should designate whether the sample is grab or composite.
- Space No. 5 should be completed with the sampling location.
- Space No. 6 should contain the signature(s) of the sampler(s).
- Space No. 7 should designate whether a preservative has been added to the sample. If a preservative has been added to the sample, the name of the preservative should be written in the space marked "Remarks."
- Space No. 8 should designate all appropriate analyses to be performed by the laboratory.
- The remarks section should include the traffic report sample number and bottle lot number.

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FIGURE 1

SAMPLE TAG

 GPO 806-467

Designator:	Grub	Preservative: Yes <input type="checkbox"/> , No <input type="checkbox"/>
	Comp.	
Time	3A	ANALYSES 8
	3B	
Month/Day/Year	38	BOD Anions
		Solids (TSS) (TDS) (SS)
Station No.	2	COD, TOC, Nutrients
		Phenolics
Project Code	1-	Mercury
		Metals
Station Location 5		Cyanide
		Oil and Grease
Station Location 6		Organics GC/MS
		Priority Pollutants
Station Location 5		Volatile Organics
		Pesticides
Station Location 5		Mutagenicity
		Bacteriology
Station Location 5		Remarks:
Tag No. Lab Sample No.		
3-158232		

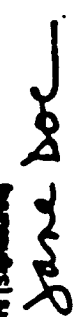
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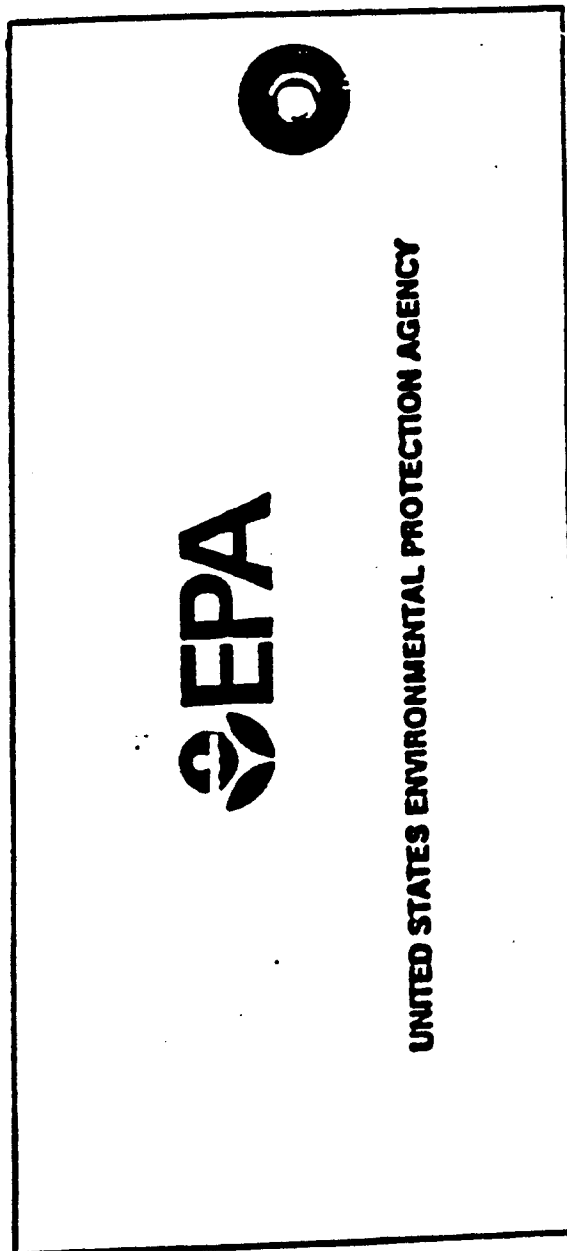
Title: Sample Custody

FIGURE 1A

SAMPLE TAG

OPO 776-112

Project Code W65 310.C01 21. SM10.0	Station No. HW 26 55-11(6)	Month/Day/Year 5-28-93	Time 1007	Designation	
				Comp.	Grid
Station Location Monitoring well #26 Split Spoon #11				Preservative: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
				ANALYSES	
Samplers (Signature) 				BOD	
				Anions	
				Solids (F&S) (TDS) (SS)	
				COO, TOC, Nutrients	
				Phenolics	
				Mercury	
				Metals	
				Cyanide	
				Oil and Grease	
				Organics GC/MS	X
				Priority Pollutants	X
				Volatile Organics	X
				Pesticides	X
				Mutagenicity	
Bacteriology					
Remarks: Case 1746 IIR # H E0637 Bottle Lot # 63120					
Tag No. H0502		Lab Sample No.			



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## **2.3 CUSTODY SEALS**

A custody seal is an adhesive label. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been packed for shipping. When samples are shipped to an EPA regional CLP laboratory, they must be placed in containers sealed with EPA custody seals. Custody seals differ among EPA regions; three examples are shown on Figure 2. Some custody seals are serially numbered; others are unnumbered and only provide evidence that the sample has not been tampered with. Two seals must be signed and placed on each shipping container or cooler: one at the front and one at the back as shown on Figure 3. Clear tape should be placed over the seals to help ensure that they are not accidentally broken during shipment.

## **2.4 CHAIN-OF-CUSTODY RECORDS**

All sample shipments should be accompanied by a chain-of-custody record (see Figures 4 and 4A) that identifies their contents. The original record should accompany the shipment, and the yellow copy should be given to the PRC field team leader. Because field sample data may be the object of litigation, the custody of the samples must be documented from collection through laboratory analysis. A chain-of-custody record accompanies the samples to identify each transfer of custody. Individuals relinquishing and receiving samples should sign, date, and note the time of transfer on the record. This record should be used to document sample custody transfer from the sampler to another PRC team member, to a shipper, or to the regional or CLP laboratory. All field sampling personnel should sign the form as field samplers. The first individual to relinquish custody must sign the chain-of-custody record as a field sampler.



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FIGURE 2  
CUSTODY SEALS

ENVIRONMENTAL PROTECTION AGENCY	SAMPLE NO.	SEAL NUMBER DATE
	SIGNATURE	
	PRINT NAME AND TITLE (Inspector, Analyst or Technician)	

EPA Form 7500-2 (10-71)

CUSTODY SEAL			CUSTODY SEAL
			Date
			Signature

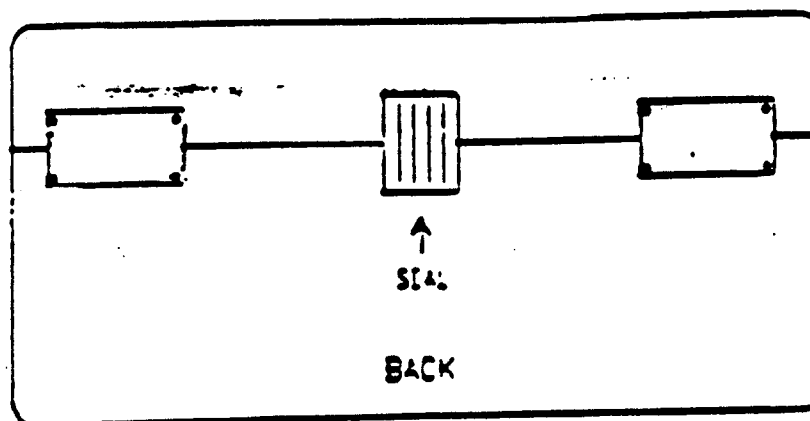
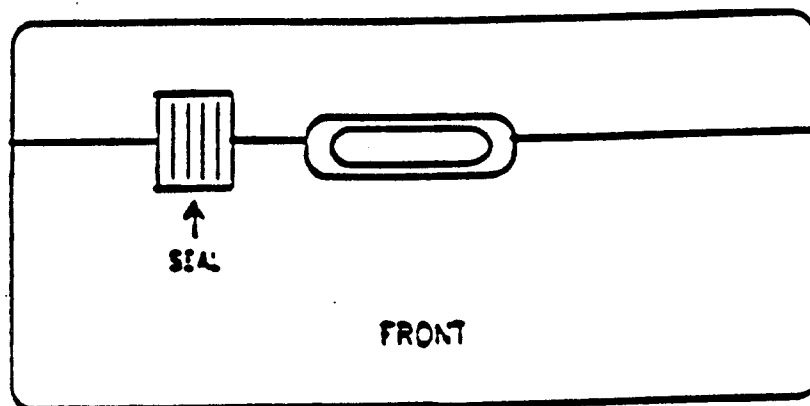
 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY OFFICIAL SAMPLE SEAL	SAMPLE NO.	DATE	SEAL NUMBER DATE
	SIGNATURE		
	PRINT NAME AND TITLE (Inspector, Analyst or Technician)		

EPA FORM 7500-2 (10-71)

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**FIGURE 3**  
**PLACEMENT OF SECURITY SEALS ON**  
**SHIPPING CONTAINERS AND COOLERS**



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**FIGURE 4**  
**CHAIN-OF-CUSTODY RECORD**

[illegible]

PRC Environmental Management, Inc.  
Standard Operating Procedure

SOP No. 018  
Page 10 of 26  
Revision No.: 2  
Revision Date: 12/31/92

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FIGURE 4A  
CHAIN-OF-CUSTODY RECORD

CHAIN OF CUSTODY RECORD															
PROJ. NO. 12-2456		PROJECT NAME # 0123				NO. OF CON- TAINERS	<div style="text-align: center;"> <i>Total Metals</i>  <i>Chronic</i> </div>						REMARKS		
SAMPLERS: <i>John Samples</i>															
STA. NO.	DATE	TIME	Q1	Q2	STATION LOCATION							ITA	Tag #		
001	9/26	8:00	X		LDC-ST-010	2	X	X				ME1701	5-102501		
												-	5-102502		
002	9/26	11:00	X		LDC-ST-011	2	X	X				ME1702	5-102503		
												-	5-102504		
003	9/26	14:00	X		LDC-ST-012	2	X	X				ME1703	5-102505		
												-	5-102506		
004	9/26	17:00	X		LDC-ST-013	2	X	X				ME1704	5-102507		
												-	5-102508		
005	9/26	18:00	X		LDC-ST-014	2	X	X				ME1705	5-102509		
												-	5-102510		
Relinquished by: <i>John Samples</i>						Date / Time 9/26 18:00		Received by: <i>Federal Express</i>				Date / Time		Received by: <i>Signature</i>	
Relinquished by: <i>Signature</i>						Date / Time		Received by: <i>Signature</i>				Date / Time		Received by: <i>Signature</i>	
Relinquished by: <i>Signature</i>						Date / Time		Received for Laboratory by: <i>Mary Sunshine</i>				Date / Time 9/27 10:00		Remarks CASE # 000 Fed. Ex. # 123456789 Custody Seals # 81122 : 81123	

Samples should be packaged properly for shipment (as detailed in SOP No. 019) and should be dispatched to the appropriate laboratory for analysis. A separate chain-of-custody record should accompany each shipment.

Whenever samples are split with another party, it should be noted in the remarks section of the chain-of-custody record.

The procedure for completing the chain-of-custody record is as follows:

1. Space 1 should list the case number provided by the laboratory.
2. Space 2 should list the initials of the site name.
3. Space 3 should contain the signature(s) of the sampler(s).
4. Column 4 should list the sampling location number for each sample shipped.
5. Columns 5A and 5B should list the date and time each sample was taken.
6. Columns 6A and 6B should indicate whether each sample shipped was a composite or grab sample.
7. Column 7 should list the sampling location for each sample.
8. Column 8 should list the total number of sample containers for each sample shipped.
9. Columns 9A through 9F should indicate the type of sample shipped.
10. Column 10 should list the traffic report sample number and the sample identification tag number for each sample container shipped.
11. Space 11 should contain the signature of the sample collector.
12. Spaces 12A and 12B should list the date and time the samples were relinquished by the sample collector.

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13. Space 13 should list the carrier's name and the airbill number.
14. The sample cooler should be properly packed for shipping.
15. The completed original, white copy of the chain-of-custody record, should be shipped inside the cooler, as detailed in SOP No. 019. The yellow copy should be retained by the PRC field team leader and should be placed in the project file.

If sent by mail, the package should be registered and a return receipt should be requested. If sent by common carrier, a bill of lading should be used. Air freight shipments should be sent collect. Freight bills, postal service receipts, and bills of lading should be retained as part of the chain-of-custody documentation (see Figure 5). The carrier will provide the forms and instructions for filling them out.

## **2.5 TRAFFIC REPORTS**

Different traffic report forms are used for each of the major types of assay under the CLP. These include organic, inorganic, dioxin, and special analytical service (SAS).

### **2.5.1 Organic and Inorganic Traffic Reports**

For samples shipped to CLP laboratories for organic and inorganic analysis, field investigation personnel should use Organic Traffic Report forms (see Figures 6 and 6A) and Inorganic Traffic Report forms (see Figures 7 and 7A) provided by EPA.

Traffic reports are preprinted forms provided by EPA's Sample Management Office (SMO). These forms are part of EPA's sample tracking system and are used to trace shipment of samples for CLP laboratory analysis.

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**FIGURE 5**

# AIRBILL

[illegible]

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**FIGURE 6**  
**ORGANIC TRAFFIC REPORT**

[illegible]

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# FIGURE 6A ORGANIC TRAFFIC REPORT

EPA United States Environmental Protection Agency Contract Laboratory Program PO Box 618 Albuquerque, NM 87106 703-652-1400 FTS 652-1400										Organic Traffic Report (For CLP Use Only)		Case Number 10001	Lab No. (if applicable)
<b>1. Type of Activity (Check one)</b> <input type="checkbox"/> SWP <input type="checkbox"/> PLE <input type="checkbox"/> PA <input type="checkbox"/> ST <input type="checkbox"/> RSE <input type="checkbox"/> SM <input type="checkbox"/> CM <input type="checkbox"/> PD <input type="checkbox"/> ST <input type="checkbox"/> Other (Specify) <b>Non-Regulated Program</b> <b>Site Name</b> Drum Site <b>City/State</b> Anytown, MA 03				<b>2. Region Number</b> I <b>Sample Number</b> XYZ Co. <b>Sample Name</b> Joe Sampler <b>Site Use</b> CLP Lab 100 Main St. Tiny Town, ME 00000 Attn M. Spec		<b>3. Date Shipped</b> 11-4-88 <b>Carrier</b> Fed Ex <b>Notes</b> Ship volume required for metals ophthalmology required sample. Ship medium and high concentration samples in port cans. See notes for additional instructions.		<b>4. Sample Description (Enter in Column 4)</b> 1. Surface Water 2. Ground Water 3. Leachate 4. Filtrate 5. Soil/Sediment 6. OS (SAB) 7. Waste (SAB) 8. Other (SAB) (Specify)					
CLP Sample Number (From Study)	CLP Sample Type (From Study)	CLP Sample Volume (From Study)	CLP Analysis			Special Handling	Sample Location	Date/Time of Sample Collection	Corresponding CLP Sample Number				
AB/23	2	L	X	X	X		MW-1	11-3/0800	MAZ 221				
AB/24	2	L	X	X	X		MW-2	11-3/0830	MAZ 22				
AB/25	2	L	X	X	X		MW-3	11-3/0845	MAZ 223				
AB/26	2	L	X	X	X		MW-4	11-3/0900	MAZ 224				
AB/27	2	L	X	X	X		MW-5	11-3/1000	MAZ 225				
AB/28	2	L	X	X	X		MW-6	11-3/1030	MAZ 226				
AB/29	2	L	X	X	X		MW-7	11-3/1100	MAZ 227				
AB/30	2	L	X	X	X		MW-8	11-3/1130	MAZ 228				
AB/31	2	L	X	X	X		MW-9	11-3/1400	MAZ 229				
AB/32	2	L	X	X	X		MW-10	11-3/1500	MAZ 230				
AB/33	2	L	X	X	X		MW-11	11-3/1530	MAZ 231				
AB/34	2	L	X	X	X		MW-12	11-3/1600	MAZ 232				
AB/35	2	L	X	X	X	MS/MSD	MW-13	11-3/1700	MAZ 233				
AB/36	2	L	X	X	X		MW-14	11-4/0900	MAZ 234				
AB/37	2	L	X	X	X		MW-15	11-4/1000	MAZ 235				
AB/38	2	L	X	X	X		MW-16	11-4/1100	MAZ 236				
<p>SHIPPING COMPLETE</p> <p>No more to ship under this case no.</p>													



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# FIGURE 7A INORGANIC TRAFFIC REPORT

United States Environmental Protection Agency Central Laboratory Program Sample Management Office PO Box 910 Alexandria, VA 22303 703-557-7000 FTS 557-7000										Inorganic Traffic Report (For CLP Use Only)		Case Number 10101	SAS No. (if applicable)
<b>1. Type of Activity (Check one)</b> <input type="checkbox"/> INF <input type="checkbox"/> MFLD <input type="checkbox"/> PA <input checked="" type="checkbox"/> SI <input type="checkbox"/> STBI <input type="checkbox"/> ECH <input type="checkbox"/> OAM <input type="checkbox"/> PD <input type="checkbox"/> ST <input type="checkbox"/> Other (Specify)				<b>2. Region Number</b> <input checked="" type="checkbox"/> X		<b>Sampling Co.</b> Acme Co.		<b>4. Date Shipped</b> 11-4-88		<b>Account Number</b> 0987654321		<b>5. Sample Description (Enter in Column A)</b> 1. Surface Water 2. Ground Water 3. Leachate 4. Filtrate 5. Soil/Sediment 6. Oil (SAS) 7. Waste (SAS) 8. Other (SAS) (Specify)	
<b>Non-Superfund Program</b> Site Name Drum Site				<b>3. Ship To:</b> Analytical Lab 100 Carter Ave Anytown, CA 94568		<b>Carrier</b> Fed Ex		Double volume required for metals split/replicate separate sample. Ship medium and high concentration samples in pairs only. See source for additional instructions.					
<b>City/State</b> Green City, OR				<b>Site Code</b> 05		<b>Ship To:</b> Attn: A. Metal							
CLP Sample Number (From Label)	(A) Sample Description (From Form 9)	(B) Concentration Unit (From Material Analysis)	(C) RAD Analysis		(D) Special Handling	(E) Station Location	(F) Date/Time of Sample Collection	(G) Corresponding Organic Sample Number					
MTZ 900	1	L	X	X		LOC-1	11-4/0700	JA 321					
MTZ 901	1	L	X	X		LOC-2	11-4/0730	JA 322					
MTZ 902	1	L	X	X		LOC-3	11-4/0800	JA 323					
MTZ 903	1	L	X	X		LOC-4	11-4/0830	JA 324					
MTZ 904	1	L	X	X		LOC-5	11-4/0900	JA 325					
MTZ 905	1	L	X	X		LOC-6	11-4/0930	JA 326					
MTZ 906	1	L	X	X		LOC-7	11-4/0945	JA 327					
MTZ 907	1	L	X	X		LOC-8	11-4/1000	JA 328					
MTZ 908	1	L	X	X		LOC-9	11-4/1030	JA 329					
MTZ 909	1	L	X	X		LOC-10	11-4/1100	JA 330					
MTZ 910	1	L	X	X		LOC-11	11-4/1130	JA 331					
MTZ 911	1	L	X	X		LOC-12	11-4/1200	JA 332					
MTZ 912	1	L	X	X		LOC-13	11-4/1215	JA 333					
MTZ 913	1	L	X	X		LOC-14	11-4/1245	JA 334					
MTZ 914	1	L	X	X		LOC-15	11-4/1300	JA 335					
MTZ 915	1	L	X	X		LOC-16	11-4/1330	JA 336					
MTZ 916	1	L	X	X		LOC-17	11-4/1400	JA 337					
MTZ 917	1	L	X	X		LOC-18	11-4/1430	JA 338					
MTZ 918	1	L	X	X		LOC-19	11-4/1500	JA 339					
MTZ 920	1	L	X	X	MS / dup	LOC-20	11-4/1530	JA 340					

EPA Form 910-1 (2-88) Replaces EPA Form 910-4, which may be used. Green - BMD Copy Pink - Region Copy White - Lab Copy for Return to BMD Yellow - Lab Copy

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The CLP generates unique sample numbers for each organic and inorganic sample. The unique sample numbers are printed on adhesive labels. The sampler is responsible for assigning this critical sample number correctly and transcribing it accurately onto the traffic report. The labels should be attached to each sample container prior to shipment. Organic sample number labels have the format XX123 and have 10 labels per strip: four for extractables, two for volatile organic analyses (VOA), and four extra blanks. Inorganic sample number labels have the format MXX123 and have seven labels per strip: two for total metals, two for cyanide, and three extra blanks (see Figure 8). The unique sample number must be used only once. Unused labels should be destroyed to prevent duplication of sample numbers.

Organic and inorganic traffic reports should be completed as follows:

- The spaces indicated by case number and Special Analytical Service (SAS) number (if applicable) in the top right corner should be completed with the appropriate numbers.
- Box 1 should indicate the type of sampling activity performed, the site name, the city, the state, and the site spill identification number.
- Box 2 should indicate the EPA region number, the name of the sampling company, and the name of the sampler.
- Box 3 should indicate the name of the sample custodian or CLP contact the sample is being shipped to, the name of the CLP laboratory, and its full address.
- Box 4 should indicate the date shipped, the carrier (abbreviated), and the airbill number.
- The CLP sample number from the printed sample labels should be listed in the far left column.

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FIGURE 8

SAMPLE NUMBER LABELS

INORGANIC  
SAMPLE NUMBER  
LABELS

MOCK 00	- Total Metals
MOCK 00	- Total Metals
MOCK 00	- Cyanide
MOCK 00	- Cyanide
MOCK 00	
MOCK 00	
MOCK 00	

ORGANIC  
SAMPLE NUMBER  
LABELS

CCN 20	- Extractable
CCN 20	- Extractable
CCN 20	- Extractable
CCN 20	- Extractable
CCN 20	- VOA
CCN 20	- VOA
CCN 20	
CCN 20	
CCN 20	
CCN 20	

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- Column A should indicate the appropriate sample description code from box 5. Blanks should be listed as item 3, "leachate." The word "blank" should be written in column D, the special handling section. Item 6, "oil," and item 7, "waste," should be used for Routine Analytical Service (RAS) PLUS SAS projects only. Do not ship oily samples or waste without making prior arrangements with the SMO.
- Column B should indicate the concentration of the sample shipped. For organic samples, low- or medium-concentration samples should be labeled "L," and high-concentration samples should be labeled "H." For inorganic samples, low-concentration samples should be labeled "L," medium-concentration samples should be labeled "M," and high-concentration samples should be labeled "H." Do not ship high concentrated samples without making prior arrangements with the SMO.
- Column C should indicate the appropriate analytical fractions requested under RAS for each sample.
- Column D should specify any special handling instructions for each sample. Blank samples should be identified in this space. When shipping RAS PLUS SAS samples, the sampler may code SAS parameters in the blank space and enter the codes in this column.
- Column E should indicate the sampling location.
- Column F should indicate the date and time of sample collection.
- Column G should indicate the corresponding CLP sample number for organic or inorganic analysis.

The original, white copy of the traffic report should be sent to SMO, P.O. Box 818, Alexandria, Virginia 22313. The phone number of the SMO is 703/557-2490. The pink copy should be retained by the PRC field team leader. The other white copy and the yellow copy should be sent with the shipment to the laboratory. The address of the laboratory will be provided by SMO.

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### **2.5.2 Dioxin Shipment Record**

The CLP Dioxin Shipment Record, a four-part, carbonless form, is used to document samples for the dioxin program (see Figures 9 and 9A). This form must be used for any dioxin samples. The dioxin shipment record provides documentation in each shipment of dioxin samples.

The form is similar to the traffic reports described above. To provide a permanent record of each sample collected, the sampler should record the appropriate case number and batch or shipment number on each shipment record form. The sampler should record the type of sampling activity, regional information, shipping information, and analysis laboratory. For each sample, the sampler should record the sample matrix and its description, such as soil or sediment field sample or solvent rinsate, by checking the appropriate box following each sample number.

After completing the dioxin shipment record, the sampler should send the bottom two copies to the laboratory with the sample shipment. Following sample shipment, the sampler should send the top copy to the SMO and retain the remaining copy as a file copy.

### **2.5.3 Special Analytical Service (SAS) Packing List**

For samples requiring special analytical services, samplers should use the SAS Packing List, a four-part carbonless form (see Figures 10 and 10A). The packing list provides space for up to 20 samples on one form. These samples should be numbered with the SAS number provided by the SMO. The SAS number, such as 2000E, should be followed by a hyphen and a progressive numerical designation starting with one, such as 2000E-1, 2000E-2, 2000E-3, and so on. If the sampling activity continues for several days and requires more than one list, sample numbers should not be repeated. EPA's regional office will verify with SMO that the packing list is appropriate for use in the situation.

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**FIGURE 9**  
**CLP DIOXIN SHIPMENT FORM**

[illegible]

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# FIGURE 9A CLP DIOXIN SHIPMENT FORM

USEPA Contract Laboratory Program  
Sample Management Office  
P.O. Box 915 Alexandria, Virginia 22304  
FTE 8-667-9480 TDD 867-9480

CASE NO: 3000	BATCH NO: 03
SAS NO: N/A	

## CLP DIOXIN SHIPMENT RECORD

Type of Activity (circle one) Sampling <input checked="" type="radio"/> PA or EPA <input type="radio"/> OR PA or EPA <input type="radio"/> OTHER <input type="radio"/>	Region Number: <u>IV</u>	Ship To: <u>Dioxin Lab</u>
Site Name: <u>Drum Site</u>	Sampling Contact: <u>John Digger</u>	<u>100 Oak Run</u>
City, State: <u>Pineville, FL</u>	Sampling Date: <u>11/1/92</u>	ATTN: <u>H. Analyst</u>
Sampling Date: <u>11/1/92</u>	Center: <u>Fed. Ex.</u>	Date Shipped: <u>11/2/92</u>
<p>Comments: 1) Ship all samples in same area, with sample labels affixed to outside of can. 2) Use TCE or another organic solvent for dioxin samples. 3) Sample Volume Required: 200 ml. per sample in glass jar. Additive: 2 liters per sample in other glass. Send one 4 liter sample per batch of samples submitted for lab CC. 4) Samples to ship will be analyzed at Lab as a split sample (SC). If this sample requires analysis prior to splitting, the carrier must supply a separate sample labeled with a unique sample number.</p>		

CLP SAMPLE NUMBER (from label)	SAMPLE DESCRIPTION						SPECIFY ADDITIONAL SAS ANALYSIS (if required)
	SOL OR SEDIMENT	AQUEOUS	GROUP FENOLATE (SOLID SOLV)	OTHER (SAS ONLY)	SAMPLE TO: (SOLV ONLY)	SAMPLE TO: (SOLV ONLY)	
bb011201	X						bb1-1
bb011202	X						bb1-2
bb011203	X						bb1-3
bb011204	X						bb2-1
bb011205	X						bb2-1A
bb011206			X				bb2-2
bb011207	X						bb2-3
bb011208	X				X		bb3-1
bb011209	X						bb3-2
bb011210	X						bb3-3
bb011211	X						bb3-4
bb011212	X					X	bb4-1
bb011213	X						bb4-2
bb011214	X						bb5-1
bb011215	X						bb5-2
bb011216	X						bb6-1
bb011217	X						bb6-2
bb011218	X						bb6-3
bb011219	X						bb7-1
bb011220	X						bb7-2
bb011221	X						bb8-1
bb011222		X			X		bb9-1
bb011223		X				X	bb9-2
bb011224		X					bb9-3

WHITE (SAS) Green YELLOW (SAS) Green PINK (SAS) Green to Yellow to (SAS) GOLD (SAS) Green

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FIGURE 10

SPECIAL ANALYTICAL SERVICE PACKING LIST

U.S. ENVIRONMENTAL PROTECTION AGENCY  
CLP Sample Management Office  
P.O. Box 818 - Alexandria, Virginia 22313  
Phone: 703/557-2490 - FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICE  
PACKING LIST

Sampling Offices	Sampling Date(s)	Ship To	For Lab Use Only
Sampling Contacts	Date Shipped		Date Samples Rec'd
(name)	Site Name/Codes	Attn	Received By
(phone)			

Sample Numbers	Sample Description La., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

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FIGURE 10A  
SPECIAL ANALYTICAL SERVICE PACKING LIST

U.S. ENVIRONMENTAL PROTECTION AGENCY  
CLP Sample Management Office  
P.O. Box 818 - Alexandria, Virginia 22313  
Phone: 703/557-2490 - FTS/557-2490

SAS Number  
1000 - A

SPECIAL ANALYTICAL SERVICE  
PACKING LIST

Sampling Office: <u>Region I</u>	Sampling Date(s): <u>11/2 - 11/4/88</u>	Ship To: <u>SAS LAB</u> <u>100 Main Street</u> <u>Anytown, CO 98765</u>	For Lab Use Only
Sampling Contact: <u>Joe Samplex</u> (name)	Date Shipped: <u>11/4/88</u>	As to: <u>Jim Smith</u>	Date Samples Rec'd:
<u>617/555-1234</u> (phone)	Site Name/Code: <u>#01</u>		Received By:

Sample Numbers	Sample Description Ln., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1. <u>1000A - 01</u>	<u>LOW CONC. WATER - 2,4-D; 2,4,5-TP</u>	
2. <u>1000A - 02</u>	"	
3. <u>1000A - 03</u>	"	
4. <u>1000A - 04</u>	"	
5. <u>1000A - 05</u>	"	
6. <u>1000A - 06</u>	"	
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____
11. _____	_____	_____
12. _____	_____	_____
13. _____	_____	_____
14. _____	_____	_____
15. _____	_____	_____
16. _____	_____	_____
17. _____	_____	_____
18. _____	_____	_____
19. _____	_____	_____
20. _____	_____	_____

For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

**Date of Original Issue: 03/31/91**

**Title: Sample Custody**

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The sampler should complete the list by recording the SAS number, site name, location, sampling date, shipment date, analysis laboratory, sampling office (the organization that did the sampling), sampler names, sampler telephone number, individual SAS sample numbers, and sample description. The description must include the sample matrix, concentration (if applicable), and analyses to be done. After completing the list, the sampler should send the bottom two copies to the laboratory with the sample shipment. Following sample shipment, the sampler should send the top copy to the SMO and should retain the second copy as a file copy.

**SOP No. 019 Packaging and Shipping Samples  
(12 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

**STANDARD OPERATING PROCEDURE**

**PACKAGING AND SHIPPING SAMPLES**

**SOP NO. 019**

**REVISION NO. 4**

Approved by:

  
\_\_\_\_\_  
Quality Assurance Officer

7/11/94  
\_\_\_\_\_  
Date

Date of Original Issue: 03/31/91

Title: Packaging and Shipping Samples

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## **1.0 BACKGROUND**

In any sampling program, the integrity of a sample must be ensured from its point of collection to its final disposition. Procedures for classifying, handling, and shipping samples are described below. Steps in the procedure should be followed to ensure sample integrity and to protect the welfare of persons involved in shipping and receiving samples. When sent by common carrier, the packaging, labeling, and shipping of hazardous wastes and substances are regulated by the U.S. Department of Transportation [DOT, Code of Federal Regulations, Title 49, (49 CFR)].

### **1.1 PURPOSE**

This standard operating procedure (SOP) establishes the requirements and procedures for packaging and shipping samples. It has been prepared in accordance with the U.S. Environmental Protection Agency (EPA)/National Enforcement Investigation Center (NEIC) "User's Guide to the EPA Contract Laboratory Program." Sample packaging and shipping procedures described in this SOP should be followed for all sample packaging and shipping unless revised by EPA. All revisions will be documented in the field logbook.

### **1.2 SCOPE**

This SOP applies to sample classification, packaging, and shipping.

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### **1.3 DEFINITIONS**

**Custody Seal** -- A custody seal is a tape-like seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been packed for shipping.

**Environmental Samples** -- Environmental samples typically contain low concentrations of contaminants and require only limited precautionary procedures. Only those samples meeting the required specifications of the contract laboratory program (CLP) low-concentration designation should be considered environmental samples. If any doubt exists about the extent of contamination, samples should be treated as hazardous.

**Hazardous Samples** -- Hazardous samples should be packaged and labeled according to procedures specified by the federal DOT or the state DOT, whichever is more stringent. Hazardous samples meet the required specifications of the CLP medium- or high-concentration designations. Samples containing an unknown concentration of contaminants must also be considered hazardous. DOT has established a classification and priority system for hazardous material (see Table 1). Specific chemicals can be classified by the tables in 49 CFR 172.101 or 49 CFR 172.102.

### **1.4 REFERENCES**

U.S. Environmental Protection Agency, 1988, User's Guide to the Contract Laboratory Program.  
EPA Office of Emergency and Remedial Response, Washington, D.C.

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Title: Packaging and Shipping Samples

**TABLE 1**  
**DOT HAZARDOUS MATERIALS CLASSIFICATION**

1. Radioactive Material
2. Poison A
3. Flammable Gas
4. Nonflammable Gas
5. Flammable Liquid
6. Oxidizer
7. Flammable Solid
8. Corrosive Material (liquid)
9. Poison B
10. Corrosive Material (solid)
11. Irritating Materials
12. Combustible Liquid (in containers having a capacity exceeding 110 gallons)
13. Other Regulated Material (ORM)-B
14. ORM-A
15. Combustible Liquid (in containers having a capacity of 110 gallons or less)
16. ORM-E

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**Note:**

PRC will not ship explosives, so they have been omitted. ORM-C and ORM-D are not relevant for hazardous waste samples.

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## **1.5 REQUIREMENTS AND RESOURCES**

The following equipment is required for proper packaging and shipping of samples:

- All normal sampling equipment (containers, labels, ice, chain-of-custody forms, vermiculite, coolers, and so on) as given in the site-specific sampling plan. Note that only inert noncombustible packing material (not plastic chips) can be used.
- Paint cans to hold sample containers
- Labels for hazardous materials, such as flammable liquid, flammable solid, and so on
- Special airbills for hazardous material shipment

## **2.0 PROCEDURES**

The following procedures apply to handling liquid and solid samples.

### **2.1 PACKAGING ENVIRONMENTAL SAMPLES**

Environmental samples are collected in an appropriate container, sealed, and labeled. The container is then sealed inside a ziplock polyethylene bag. The sealed package is then placed in an iced cooler, and packed to prevent breakage (for example, sample containers are surrounded with vermiculite or other inert packaging material). After chain-of-custody forms are completed, they are sealed in plastic bags and taped inside the lid of the cooler.

Custody seals will be signed and attached to the cooler so that any tampering will be detected.

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## 2.2 CLASSIFYING HAZARDOUS SAMPLES

First, classify the hazardous samples following the priorities given in Table 1. Initially, all samples should be surveyed for radiation. If radiation levels are below 0.5 millirems per hour (mR/h) at the surface of the package material, the sample should not be shipped as radioactive. If the radiation level exceeds 0.5 mR/h, the sample should be shipped as radioactive. Consult 49 CFR 173, Subpart I, for proper definition and shipping of a radioactive sample.

Poison A is the next category on the DOT list (see Table 2). According to DOT, Poison A substances are gases or liquids that are life threatening in very small amounts (49 CFR 173.326). Many of the Poison A materials are gases or compressed gases that would not be found in drum-type containers. Liquid Poison A substances would probably be found in closed containers, a situation that presents a "worst case" scenario. Not all samples found in drums should be labeled "Poison A." Based on the information available, a judgment must be made as to the hazard class of the sample. If the sample is suspected or determined to fall within the "Poison A" classification, packaging procedures specified by DOT should be followed as specified in 49 CFR 173.326-328.

The next two classifications in the DOT series are "flammable gas" and "nonflammable gas" (49 CFR 173.300). Few, if any, gas samples are expected to be collected at uncontrolled hazardous waste sites. Use this category only when shipping containerized gases or gas samples.

The next category is "flammable liquids" (49 CFR 173.115). Hazardous samples in liquid form, unless known to fall into a lower category, should be handled, packaged, and shipped at this level of concern. Lesser categories will generally not be considered because flashpoint testing required to drop to a lower level is difficult and possibly dangerous in the field. Samples should be handled at the "flammable" level, rather than undertake a field determination of flash point.

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**TABLE 2**

**THE PHYSICAL STATE OF CLASS A POISONS AT ROOM TEMPERATURE**

<u>COMPOUND</u>	<u>PHYSICAL STATE</u>
Arsine	gas
Bromoacetone	liquid
Chloropicrin and methyl chloride mixture	gas
Chloropicrin and nonflammable, nonliquified compressed gas mixture	gas
Cyanogen	gas
Cyanogen chloride	gas (above 13° C)
Gas identification set	gas
Germane	gas
Hexaethyl tetraphosphate and compressed gas mixture	gas
Hydrocyanic acid (prussic solution)	liquid
Hydrocyanic acid, liquified	gas
Insecticide liquified gas (containing Poison A or Poison B material)	gas
Methyldichloroarsine	liquid
Nitric oxide	gas
Nitrogen dioxide, liquid	gas
Nitrogen peroxide	gas
Nitrogen tetroxide	gas
Parathion and compressed gas mixture	gas
Phosgene (diphosgene)	gas (liquid)
Phosphine	gas
Tetraethyl dithiopyrophosphate and compressed gas mixture	gas
Tetraethyl pyrophosphate and compressed gas mixture	gas

**Note:**

Phosgene and diphosgene are two chemicals covered by one name in DOT regulations.

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Solids samples known or suspected to be flammable should be shipped as "flammable solids" (49 CFR 173.150). Based on characteristics of the sample and DOT regulations, nonflammable solids may be shipped as "Poison B" (49 CFR 173.343), "corrosive" (49 CFR 173.240), or "irritant materials" (49 CFR 173.381).

A single package containing less than 5 pounds of solid or less than 1 pint of liquid hazardous waste may be shipped as Other Regulated Material (ORM). If the material is known, the ORM-A or ORM-B classification may be used. ORM-A and ORM-B materials are listed in 49 CFR 173, parts K and L. If the material is unknown or not listed under parts K and L, the ORM-E category may be used. The ORM-E category is used for hazardous waste liquids and solids not otherwise specified.

Because of the low levels of contamination expected at most hazardous waste sites, most samples will be treated as environmental samples.

## 2.3 SAMPLE PACKAGING

An overview of the procedures to follow for packaging samples is presented below. These procedures include the following:

- Collect samples in appropriate sample containers (see SOP No. 017, Sample Collection Container Requirements, or the site-specific sampling plan). When collecting a solid material, the container and its contents shall not exceed 1 pound net weight. Large quantities of solid material (up to 1 gallon) may be collected if the flash point of the sample can be determined to be 73 degrees Fahrenheit (° F) or higher. In these cases, this information should be marked on the outside of the shipping container, but only a single (1 gallon or less) bottle may be packed in each shipping container. Shipping papers must state that the flash point is 73° F or higher.
- Seal the sample container.

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- Attach a completed sample identification tag (see SOP No. 018, Sample Custody, or the site-specific sampling plan).
- Place each container in a separate 2-millimeter thick (or thicker) recloseable, polyethylene bag. Position the sample identification tag so it can be read through the bag.
- Place each sealed bag inside a metal can or other DOT-approved container. Use only one bag per container. Pack metal can with enough noncombustible, absorbent, cushioning material (such as bentonite, vermiculite, or diatomaceous earth) to prevent breakage and provide for absorption of liquid. Close the metal can and secure the lid with clips, tape, or other positive means.
- Use labels supplied by the Regional Equipment Manager for each DOT-approved container. Label each container with the appropriate DOT hazardous labels. [For example, "Cargo Aircraft Only (Danger - Peligro)" and one of the following: "Flammable Liquid," "Flammable Solid," "Dangerous When Wet," or "Corrosive"]. Label conservatively and use "Flammable Liquid N.O.S. UN1922" for most liquids and "Flammable Solid N.O.S. UN1325" for most solids. If the sample is definitely not a flammable liquid or solid, use another category in the DOT hierarchy. Use "Not Otherwise Specified" (N.O.S.) when the sample is definitely not identified. Identify the sample by name and UN identifier when known.
- Place metal cans, other DOT-approved containers, or a single 1-gallon bottle into a strong outside shipping container, such as a metal picnic cooler or an approved fiberboard box. Surround with noncombustible, absorbent packing material for stability during transport. See Figure 1 for a summary of CLP hazardous sample packaging.
- Attach the same DOT labels as above; a limited quantity label; and a laboratory name and address label to the top and front of the cooler. Place "This End Up" labels on adjacent sides of the cooler. Do not allow labels to overlap or be covered by strapping tape.
- Attach custody seals, and secure the shipping container with strapping tape.

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## **2.4 SHIPPING PAPERS**

Use abbreviations only as specified below. Complete the bill of lading supplied by the carrier. Sign the certification statement. If no certification statement is provided by the carrier, use the standard industry form. Include the following information in the order listed: "Flammable Liquid, N.O.S. UN1933," "Flammable Solid, N.O.S. UN1325," "Cargo Aircraft Only," "Limited Quantity" (or "Ltd. Qty."), "Laboratory Samples," "Net Weight \_\_" or "Net Volume \_\_" of hazardous contents, by item, if more than one metal can is inside of the exterior container. Place the net weight or net volume just before or just after the "Flammable Liquid, N.O.S." or "Flammable Solid, N.O.S." description.

Include a complete chain-of-custody record in a recloseable, polyethylene bag in the sample container. Containers must be locked or otherwise sealed. Immediately upon shipment of samples, call the sample management office (SMO) with the site-specific information (if using the CLP RAS). If samples are shipped to a SAS or non-CLP laboratory, the laboratory should be called directly with the site-specific information. Record the communication in the field logbook. A checklist for coordinating the tasks involved in sample shipment is provided on Figure 1.

## **2.5 TRANSPORTATION**

Hazardous or environmental samples may be transported by PRC personnel in private vehicles. Samples will be shipped by Federal Express or another common carrier; however, hazardous samples cannot be transported by any carrier that also carries passengers.

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## **2.6 POTENTIAL PROBLEMS**

The following potential problems may occur during sample shipment:

- Incorrect or incomplete paperwork
- Laboratory receipt of incorrect samples
- Insufficient volume for analysis requested
- Broken or leaking samples

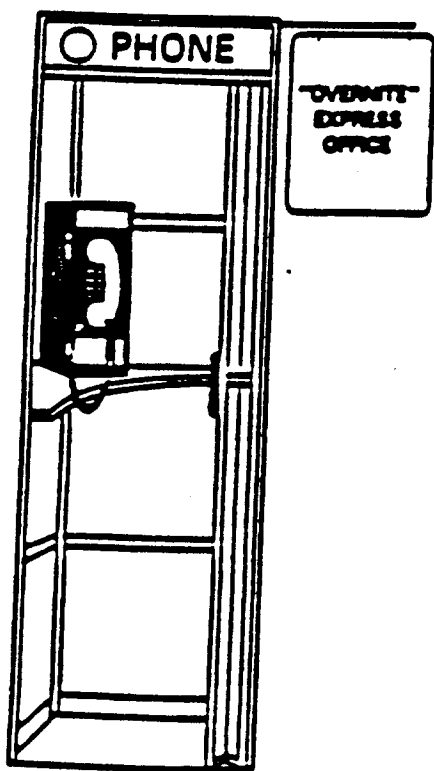
If any of these problems are encountered, immediately contact SMO (if using the CLP RAS) and the PRC Project Manager. If using a SAS or non-CLP laboratory, the laboratory and PRC Project Manager should be called immediately with any problems encountered.

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**FIGURE 1**  
**SAMPLE SHIPMENT COORDINATION CHECKLIST**

**IMMEDIATELY UPON SHIPMENT OF SAMPLES, SAMPLERS CALL  
SMO OR RSCC (AS APPROPRIATE)**



- CASE AND/OR SAS NUMBER
- NAME OF LABORATORY
- DATE OF SHIPMENT
- CARRIER, AIRBILL (SHIPMENT) NUMBERS AND TYPE OF SERVICE
- NUMBER AND MATRICES (WATERS, SOILS, ETC.) OF SAMPLES SHIPPED
- INFORMATION ON COMPLETIONS, CHANGES, DELAYS, CONTINUATIONS, ETC., PERTINENT TO THE CASE
- SAMPLER'S NAME, REGION, AND PHONE NUMBER
- SMO MUST BE NOTIFIED BY 3:00 PM ON FRIDAY FOR SAMPLES INTENDED FOR SATURDAY DELIVERY/PICKUP

**SOP No. 024 Recording Notes in the Field Logbook  
(8 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

**STANDARD OPERATING PROCEDURE**

**RECORDING NOTES IN THE FIELD LOGBOOK**

**SOP NO. 024**

**REVISION NO. 1**

Approved by:

*Harold H. Hiner*  
Quality Assurance Officer

5/18/93  
Date

## **1.0 BACKGROUND**

The field logbook should contain detailed records of all the field activities, interviews of people, and observations of conditions at a site. Entries should be described in as much detail as possible, so that personnel can accurately reconstruct the activities and events which have taken place during field assignments. Field logbooks are considered accountable documents in enforcement proceedings and may be open to review. Therefore, the entries in the logbook must be accurate, detailed, and reflect the importance of the field events.

### **1.1 PURPOSE**

The purpose of this standard operating procedure (SOP) is to provide guidance to ensure that logbook documentation for any field activity is correct, complete, and adequate. Logbooks are used for identifying, locating, labelling, and tracking samples. A logbook should document any deviations from the project approach, work plans, quality assurance plans, safety plans, sampling plans, and any changes in project personnel. They also serve as documentation of any photographs taken during the course of the project. In addition, the data recorded in the logbook may assist in the interpretation of the analytical results. A complete and accurate logbook also aids in maintaining good quality control. Quality control is enhanced by the proper documentation of all observations, activities, and decisions.

### **1.2 SCOPE**

This SOP establishes the general requirements and procedures for recording notes in the field logbook.

### **1.3 DEFINITIONS**

None.

## 1.4 REFERENCES

Compton, R.R. 1985. *Geology in the Field*. John Wiley and Sons. New York, N.Y.

## 1.5 REQUIREMENTS AND RESOURCES

The following items are required for field notation:

- Field logbooks
- Ballpoint pens with permanent ink
- 6-inch ruler (optional)

Field logbooks should be bound (sewn) with water resistant and acid-proof covers; they should have preprinted lines and wide columns. They should be approximately 7 1/2 by 4 1/2 inches or 8 1/2 by 11 inches in size. Loose-leaf sheets are not acceptable for field notes. If notes are taken on loose paper, they must be transcribed as soon as possible into a regular field logbook by the same person who took the notes.

Logbooks can be obtained through the Document Control Administrator (DCA) for each office. The DCA will have assigned each logbook an identification number. The DCA will make sure the pages in the logbooks are preprinted with consecutive numbers or are consecutively numbered by hand. If the numbers are written by hand, then numbers should be circled so that they are not confused with data.

## 2.0 PROCEDURES

The following subsections provide the general layout of a field logbook and detailed procedures for completing a field logbook.

## 2.1 GENERAL GUIDELINES

- A separate field activity logbook must be maintained for each project. If a site consists of multiple subsites, designate a separate logbook for each subsite. For special tasks, such as periodic well water-level measurements, data from multiple subsites may be entered into one logbook which contains only one type of information.
- All logbooks must be bound and contain consecutively numbered pages.
- No pages can be removed from the logbook for any purpose.
- All field activities, meetings, photographs, and names of personnel must be recorded in the site logbook.
- All logbooks pertaining to a site or subsite should be assigned a serial number based on the date the logbook is issued to the project manager. The first logbook should be assigned number 1, the next logbook issued assigned number 2, and so on. The project manager is to maintain a record of all logbooks issued under the project.
- All information must be entered with a ballpoint pen with waterproof ink. Do not use pens with "wet ink," because the ink may wash out if the paper gets wet. Pencils are not permissible for field notes because information can be erased. The entries should be written dark enough so that the logbook can be easily photocopied.
- Do not enter information in the logbook that is not related to the project. The language used in the logbook should be factual and objective.
- Begin a new page for each day's notes.
- Write notes on every line of the logbook. If a subject changes and an additional blank space is necessary to make the new subject title standout, skip one line before beginning the new subject. Do not skip any pages or parts of pages unless a day's activity ends in the middle of a page.
- Draw a diagonal line on any blank spaces of four lines or more to prevent unauthorized entries.

## **2.2 LOGBOOK FORMAT**

The layout and organization of each field logbook should be consistent with other field logbooks. Guidelines for the cover, spine, and internal pagination are discussed below.

### **2.2.1 FORMAT OF THE COVER AND SPINE OF FIELD LOGBOOKS**

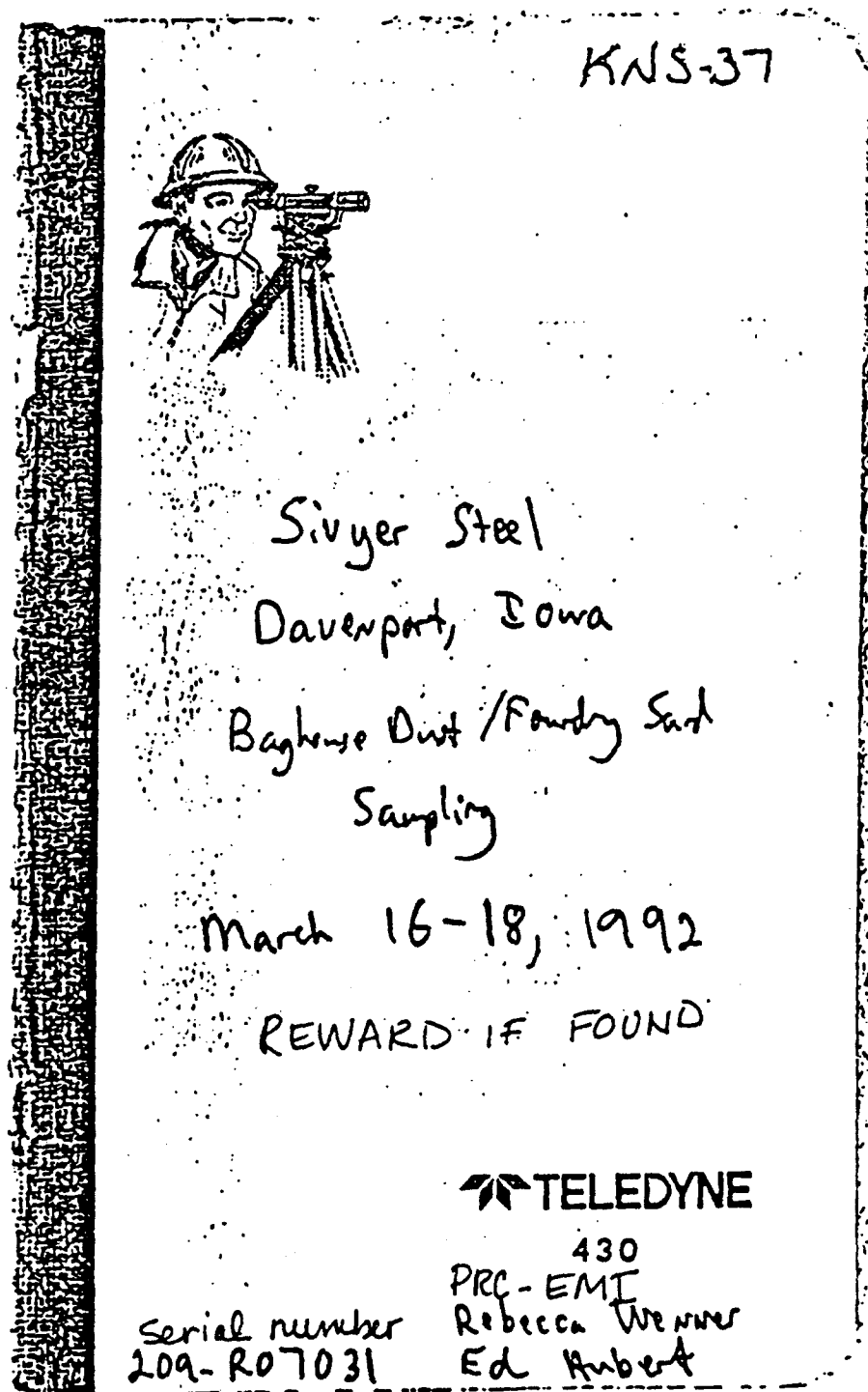
Write the following information in clear capital letters on the front cover of each logbook. An example of the cover of a logbook is included as Figure 1.

- Logbook identification number (assigned by the DCA)
- The serial number of the logbook (assigned by the project manager)
- Name of the site, city, and state
- Name of subsite if applicable
- Type of activity
- Beginning and ending dates of activities entered into the logbook
- "PRC EMI," City and State
- "REWARD IF FOUND"

Some of the information listed above, such as the list of activities and ending dates, should be entered after the entire logbook has been filled or after it has been decided that the remaining blank pages in the logbook will not be filled.

The spine of the logbook should contain an abbreviated version of the information on the cover. For example: "1, Col. Ave., Hastings, 5/88 - 8/88."

FIGURE 1  
COVER OF THE FIELD LOGBOOK



### 2.2.2 First Page of the Field Logbook

Spaces are usually provided on the inside front cover (or the opening page in some logbooks), for the company name ("PRC EMI"), address, and telephone number. If preprinted spaces for this information are not provided in the logbook, write the information on the first available page.

## 2.3 ENTERING INFORMATION IN THE LOGBOOK

Enter the following information at the beginning of each day or whenever warranted during the course of a day:

- Date
- Starting time
- Specific location
- General weather conditions and approximate temperature
- Names of personnel present at the site. Note the affiliation(s) and designation(s) of all personnel.
- Equipment calibration and equipment models used.
- Changes in instructions or activities at the site.
- Levels of personal protective clothing and equipment.
- A general title of the first task undertaken (for example, well installation at MW-11, decon at borehole BH-11, groundwater sampling at MW-11).
- Provide an approximate scale for all diagrams. If this can't be done, write "not to scale" on the diagram. Indicate the north direction on all maps and cross-sections. Label features on each diagram.
- Corrections should be made by drawing a single line through the entry being corrected. Initial and date any corrections made in the logbook.
- The person recording notes is to initial each page after the last entry. No information will be entered in the area following these initials.

- At the end of the day, the person recording notes is to sign and date the bottom of the last page. Indicate the end of the work day by writing "Left site at (time)." A diagonal line will be drawn across any blank space to the bottom of the page.

The following information should be recorded in the logbook after taking a photograph:

- Time, date, location, direction, and if appropriate, weather conditions
- Description of the subject photographed and the reason for taking the picture
- Sequential number of the photograph and the film roll number
- Name of the photographer

The following information should be entered into the logbook when taking samples:

- Location description
- Sampler's name
- Collection time
- Designation of samples as a grab or composite sample
- Type of sample (water, sediment, soil gas, etc.)
- On-site measurement data (pH, temperature, specific conductivity)
- Field observations (odors, colors, weather, etc.)
- Preliminary sample description
- Type of preservative used
- Instrument readings

## 2.4 PRECAUTIONS

Custody of field logbooks must be maintained at all times. Field personnel must keep the logbooks in a secure place (locked car, trailer, or field office) when the logbook is not in personal possession. Logbooks are official project documents and must be treated as such.

**SOP No. 065 Colorimetric Indicator Detector**  
**(7 Sheets)**

**SOP APPROVAL FORM**

**PRC ENVIRONMENTAL MANAGEMENT, INC.**

**STANDARD OPERATING PROCEDURE**

**COLORIMETRIC INDICATOR DETECTOR**

**SOP NO. 065**

**REVISION NO. 1**

Approved by:

Kathleen Homer  
Quality Assurance Officer

5/20/93  
Date

Title: Colorimetric Indicator Detector

## **1.0 BACKGROUND**

Colorimetric indicator detector tubes are used to determine the concentrations of specific ambient gaseous contaminants in the field. The tubes are commonly referred to as Draeger tubes, after the name of the company that manufactures them.

The tubes operate by drawing a known volume of air through a tube containing a contaminant-specific reagent. The air is drawn through the tube by means of a hand-held pump. The length of the color change observed in the tube translates quantitatively to parts per million (ppm), with a plus or minus accuracy range of approximately 25 percent.

This method can measure the concentrations of specific organic and inorganic vapors and gases. The vapors and gases drawn through the tube cause a discoloration in the reagent that is proportional to the concentration of material present. The detector tubes are specific for individual compounds or groups of compounds and require specific sampling techniques. Specific sampling techniques for different compounds are supplied with the tubes and detail the required sample volume, the proper tube preparation, and the applicability and limitations of individual tubes. Several hundred different Draeger tubes are available for detecting different compounds.

### **1.1 PURPOSE**

This standard operating procedure (SOP) establishes the requirements and procedure for using Draeger tubes to determine the concentrations of specific organic and inorganic vapors and gases in the field.

### **1.2 SCOPE**

This SOP applies when using Draeger tubes to determine the concentrations of specific organic and inorganic vapors and gases in the field.

Title: Colorimetric Indicator Detector

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### 1.3 DEFINITIONS

None.

### 1.4 REFERENCES

"Draeger Tube Operating Instructions" (provided with each set of Draeger tubes).

U.S. Environmental Protection Agency. 1987.

"Vapor Detection Tubes--Draeger Gas Detector Model 21/31." *A Compendium of Superfund Field Operations Methods, Volume 2*. EPA/540/P-87/001b. August.

Draegerwerk AG Lubeck. 1985. *Draeger Detector Tube Handbook*. 6th Edition. May.

### 1.5 REQUIREMENTS AND RESOURCES

- Identity of the specific contaminants to be sampled
- Draeger tube instructions included with each box of Draeger tubes
- Draeger tubes for sampling
- Hand pump
- Colorimetric indicator for the detector.

## 2.0 PROCEDURE

This section provides procedures for setting up the Draeger tube and pump and for collecting samples with them.

Title: Colorimetric Indicator Detector

## 2.1 SETTING UP COLORIMETRIC INDICATOR DETECTOR TUBE AND PUMP

To set up the Draeger tube and pump, do the following:

1. Read and understand this SOP completely. Test the pump for leaks each day. To complete this test, place an unbroken tube in the suction inlet of the pump and completely depress the bellows. The bellows should not extend completely (taut chain) in less than 30 minutes.

If the pump does not pass the leak test, proceed as follows:

- a. Remove the pump plate.
- b. Unscrew the valve with the special wrench provided with the pump.
- c. Clean the valve in water. Then dry the valve thoroughly.
- d. Replace the disc if it is sticky, brittle, hard, or cracked.
- e. Reassemble the pump.
- f. Test the pump for leaks.

If the pump passes the leak test, proceed to step 2. If the pump does not pass the leak test, it should be replaced.

2. Select the appropriate tube for the airborne contaminant of concern. Break off both tips of the tube in the breakoff eyelet or breakoff husk of the pump. Follow any other intermediate instructions provided with the tube, then insert the tube into the pump. An arrow on the tube, which indicates air-flow direction, should point toward the pump.

Title: Colorimetric Indicator Detector

## **2.2 COLLECTING SAMPLES**

To collect samples using a colorimetric indicator detector, do the following:

1. Hold the pump in your hand between the thumb and the base of the index finger with your fingers resting on the front plate.
2. Fully compress the bellows.
3. Straighten your fingers and release the pressure. The suction process occurs automatically and is complete when the limit chain is taut. Each stroke of the bellows draws 100 cubic centimeters (cm<sup>3</sup>) of air.
4. Repeat the suction process as often as is prescribed for the target compound. (Refer to the operating instructions provided with the tubes).
5. If the target compound is present in the sample, a portion of the tube will change color. Read the concentration of the compound from the scale printed on the side of the tube.
6. Remove and dispose of the used tube.

## **3.0 LIMITATIONS AND PRECAUTIONS**

The following are the limitations and precautions to be aware of when using colorimetric indicator detector tubes.

Title: Colorimetric Indicator Detector

### 3.1 LIMITATIONS

- Cross sensitivity between different compounds is common. The tubes often indicate that one compound is present when, in fact, a different compound has caused the color change in the tube.
- Readings are not specific; there is a large degree of error (ranging from plus or minus 35 percent at 1/2 the permissible exposure limit (PEL) to plus or minus 25 percent at 1 to 5 times the PEL).
- A slow response time is common. Color changes in the tubes frequently taking several minutes to occur.
- Operator error in reading the jagged edge of the color change where the contaminant meets the indicator chemical (end point) is a major cause of inaccuracy.

### 3.2 PRECAUTIONS

For safe, correct, and effective use of the apparatus, the manufacturer recommends the following:

- Use of the apparatus requires close attention to operating instructions. For example, some specific instructions for using a phosgene tube are listed below:
  - Tubes should not be reused even if they show negative results.
  - The tubes should be used only at humidity levels lower than 20 milligrams of water per liter of air. If the humidity level is higher, a conversion factor specified in the instructions should be used.
  - Tubes should be used only at temperatures between 10 and 30 degrees centigrade.
- The pump apparatus is intended only for the purposes specified by the manufacturer for purposes of air sampling.
- The apparatus should be inspected by trained instrumentation technicians at regular intervals. A report on such inspections should be prepared on a regular schedule.

**Title: Colorimetric Indicator Detector**

---

- Only parts specified by the manufacturer should be used for maintenance and repairs. Maintenance, repairs, and replacement of parts should be done only by trained technicians.

Northern and Central California, Nevada, and Utah  
Contract No. N62474-94-D-7609 (CLEAN II)  
Contract Task Order No. 0108

**Prepared For**

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NAVAL AIR STATION ALAMEDA  
ALAMEDA, CALIFORNIA

GROUNDWATER MONITORING PLAN  
VOLUME IIb: QUALITY ASSURANCE PROJECT PLAN ADDENDUM  
FINAL

OCTOBER 1997

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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY  
Northern and Central California, Nevada, and Utah  
Contract No. N62474-94-D-7609 (CLEAN II)  
Contract Task Order No. 0108

Navy Remedial Project Manager: Dennis Wong

PRC Navy CLEAN II Project Manager: Matthew Udell

NAVAL AIR STATION ALAMEDA  
ALAMEDA, CALIFORNIA

GROUNDWATER MONITORING PLAN  
VOLUME IIb: QUALITY ASSURANCE PROJECT PLAN ADDENDUM  
FINAL

OCTOBER 1997

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## ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
µg/L	Micrograms per Liter
µg/kg	Micrograms per Kilogram
bgs	Below ground surface
Cal/EPA	California Environmental Protection Agency
CFR	Code of Federal Regulations
CHSO	Corporate Health and Safety Officer
CLEAN	Comprehensive Long-term Environmental Action Navy
CLP	Contract Laboratory Program
COC	Chain of Custody
CPR	Cardiopulmonary Resuscitation
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
CTO	Contract Task Order
DDD	Dichlorodiphenyl/dichloroethane
DDE	Dichlorodiphenyl/dichloroethene
DDT	Dichlorodiphenyl/trichloroethane
DOT	Department of Transportation
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EFA West	Engineering Field Activity West
EPA	U.S. Environmental Protection Agency
eV	Electron Volt
FSP	Field Sampling Plan
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
GFAA	Graphite Furnace Atomic Absorption
HSP	Health and Safety Plan
ICP	Inductively Coupled Plasma
IDW	Investigation-Derived Waste
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
m	Meter
MD	Matrix Duplicate
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
ml	Milliliter
MP	Monitoring Plan
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NA	Not Applicable
NAS	Naval Air Station
ND	Not Detected

## ACRONYMS AND ABBREVIATIONS (Continued)

NEESA	Naval Energy and Environmental Support Activity
NSGA	Naval Security Group Activity
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	Polychlorinated Biphenyl
PE	Performance Evaluation
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
PRC	PRC Environmental Management, Inc.
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QAPP	Quality Assurance Project Plan
QCSR	Quality Control Summary Report
RCRA	Resource Conservation and Recovery Act of 1976
RI	Remedial Investigation
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RT	Regulatory Threshold
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SI	Site Investigation
SOP	Standard Operating Procedure
SOW	Statement of Work
SSO	Site Safety Officer
SVOC	Semivolatile Organic Compound
SWRCB	California State Water Resources Control Board
TCL	Target Compound List
TDS	Total Dissolved Solids
TEPH	Total Volatile Petroleum Hydrocarbon
TIC	Tentatively Identified Compound
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
U&A	Uribe and Associates
VOC	Volatile Organic Compound
WMP	Waste Management Plan

## 1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) Addendum is Volume IIb of the Groundwater Monitoring Plan and was prepared under Comprehensive Long-Term Environmental Action Navy Contract No. N62474-94-D-7609 (CLEAN II) issued by the Department of the Navy, Engineering Field Activity West (EFA West). PRC Environmental Management Inc. (PRC) authorized Uribe & Associates (U&A) to generate a Groundwater Monitoring Plan and conduct groundwater monitoring activities, including water level measurements, a tidal study, quarterly groundwater sampling, and other tasks at Naval Air Station (NAS) Alameda under Contract Task Order (CTO) No. 0108. This QAPP Addendum specifies the procedures and quality assurance/quality control (QA/QC) requirements necessary to collect environmental data of sufficient quantity and quality to meet the project objectives identified for the quarterly groundwater sampling at NAS Alameda, California. NAS Alameda is located on the east side of San Francisco Bay in Alameda, California (Figure 1-1).

The Groundwater Monitoring Plan consists of: Volume I, the Monitoring Plan (MP), and Volume II, the Sampling and Analysis Plan (SAP). The SAP, in turn, consists of Volume IIa, the Field Sampling Plan (FSP), Volume IIb, this QAPP Addendum, and Volume IIc, a Health and Safety Plan (HSP) Addendum.

Preparation of this QAPP Addendum has been in accordance with "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations," (U.S. Environmental Protection Agency [EPA] 1994a). EPA (1994a) states that the requirements for a QAPP are that (1) data quality objectives (DQO) are identified; (2) the intended measurements and data acquisitions are appropriate; (3) the quality assurance (QA) and quality control (QC) are sufficient for confirming the quality of data; and (4) limitations on the use of the data can be identified. These requirements are presented in this QAPP as five components: (1) project management; (2) quality objectives and criteria for measurement data; (3) documentation and records; (4) measurement and data acquisition; and (5) assessment and oversight.

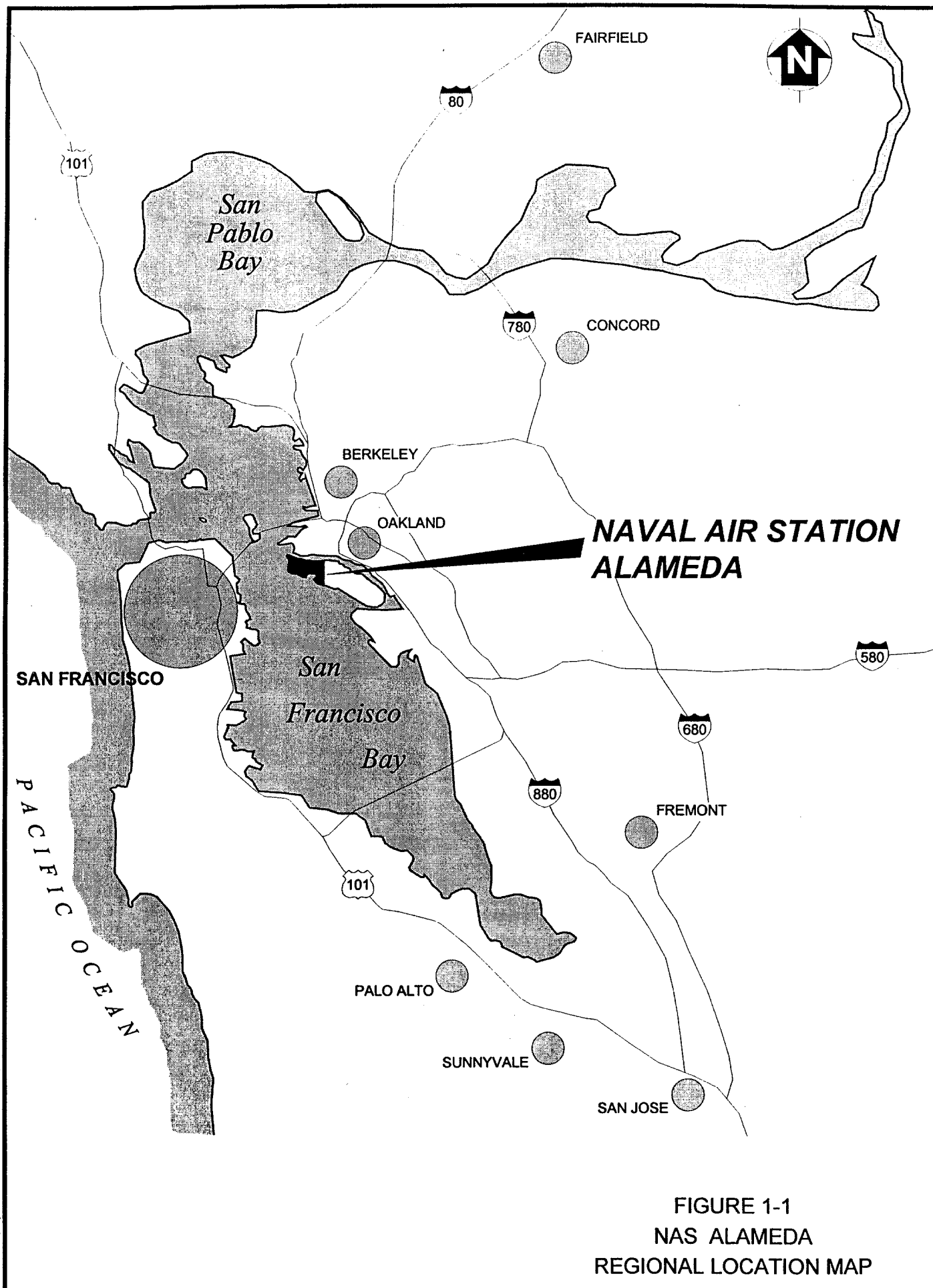


FIGURE 1-1  
NAS ALAMEDA  
REGIONAL LOCATION MAP

## 2.0 PROJECT MANAGEMENT

This section discusses the organizational structure for project management, including the roles and responsibilities of each project team member.

The NAS Alameda groundwater sampling activities will be staffed by a team with the experience and training necessary to maintain consistent quality throughout the project. The team members and their positions are as follows:

<u>Position</u>	<u>Team Member</u>
Navy Remedial Project Manager (RPM):	Dennis Wong
PRC Navy CLEAN II Program Manager:	Daniel Chow
PRC Navy CLEAN II Project Manager:	Matthew Udell
Navy Quality Assurance Officer:	Jim Brown
PRC Quality Assurance Program Manager:	Ron Riesing
PRC Project Quality Assurance Officer:	Ronald Ohta
PRC Health and Safety Program Manager:	Conrad Sherman
U&A Corporate Health and Safety Officer:	Douglas Sheeks
U&A Project Manager:	Clare Gilmore
U&A Site Safety Officer:	Clare Gilmore
PRC Project Chemist:	Gretchen Gotlieb
U&A Field Project Manager:	Brenden Mulholland

### 2.1 RESPONSIBILITIES

The specific responsibilities of the team members listed above are described in this section.

#### 2.1.1 Navy Remedial Project Manager

The Navy RPM is responsible for the following:

- Providing site information and history
- Providing logistical assistance

- Specifying sites requiring investigation
- Reviewing results and recommendations and providing management and technical oversight
- Ensuring proper review and distribution of Project Plans, Groundwater Monitoring Reports, and other documents
- Communicating comments from technical reviewers to contractors
- Ensuring that contractors address comments and take appropriate corrective actions
- Coordinating with regulatory agencies

### **2.1.2 PRC Navy CLEAN II Program Manager**

The PRC Navy CLEAN II Program Manager establishes program policies and procedures, monitors costs and performances, delegates authority, and resolves conflicts and problems. The Program Manager is responsible for the following:

- Ensuring that contract requirements are met
- Providing necessary resources to the project team to allow adequate response to requirements of the investigation
- Maintaining consistency in procedures and work products between all task orders
- Establishing and maintaining communication between the RPM, QA Program Manager, health and safety Program Manager, and project managers
- Providing guidance to project managers as needed
- Assisting the program QA manager in resolving QA issues that cannot be handled at the Project Manager or QC coordinator level
- Assisting the program QA manager with QA issues with subcontractors, if necessary
- Monitoring project managers' compliance with orders and recommendations

### **2.1.3 PRC Navy CLEAN II Project Manager**

The PRC Navy CLEAN II Project Manager is responsible for overseeing project activities and is ultimately responsible for the timely completion of the project. Responsibilities of the PRC Project Manager include the following:

- Assigning technical staff
- Developing or reviewing work plans that define the scope of field and laboratory activities and the level of documentation and QC required
- Ensuring the completion of QC requirements of the work plan by team members
- Working with QC coordinators to implement quality improvements identified during the audit and review of ongoing work
- Approving deliverables and associated documents prior to transmittal
- Procuring subcontractors and preparing statements of work for subcontractors
- Establishing and maintaining communication between technical staff, the Program Manager, the QA officer, the health and safety coordinator, and regulatory agencies
- Implementing programs and protocols related to the project

### **2.1.4 Navy Quality Assurance Officer**

The Navy QA Officer is responsible for the following:

- Review of QC documentation, audits, and technical operations as required
- Interacting with PRC's QA Program Manager about certification of laboratories, and coordinating QA and technical staff compliance with requirements
- Providing guidance to PRC's QA Program Manager in the correction of non-conformance issues
- Making recommendations to PRC's QA Program Manager regarding QA/QC topics and corrective action
- Serving as the main Navy contact for program QA matters, and providing guidance on appropriate procedures to PRC's QA Program Manager

### **2.1.5 PRC Quality Assurance Program Manager**

The PRC QA Program Manager develops and maintains a comprehensive QA program and is responsible for audits, reviews of work performed, and recommendations to technical staff and management regarding quality. The PRC QA Program Manager has the following specific responsibilities:

- Developing and revising the QA program, as required
- Assigning qualified personnel to serve as QC coordinators
- Implementing and supervising the QA program with the assistance of QC coordinators and subcontractor QA managers
- Coordinating the auditing and review of QC documentation and technical operations, as required
- Identifying nonconformance situations and reporting them to the PRC CLEAN II Program Manager
- Providing guidance to the PRC CLEAN II Program Manager in the correction of non-conformance situations
- Consulting the Navy's appointed QA officer regarding certification of laboratories, and coordinating QA and technical staff compliance with requirements
- Making recommendations to the PRC CLEAN II Program Manager regarding QA/QC topics and corrective action

### **2.1.6 PRC Project Quality Assurance Officer**

Responsibilities of the PRC Project QA Officer include:

- Preparing or reviewing the site-specific QAPP in accordance with EPA guidance documents
- Ensuring that protocols described in the QAPP are met
- Verifying that the specified data collection methods comply with EPA, Navy, and PRC QA/QC requirements, and will yield data of desired quality and integrity
- Reviewing, evaluating, and approving quality-related changes to the FSP and QAPP

- Ensuring that field and laboratory nonconformances are identified and appropriate corrective actions are taken; providing assistance to the Project Manager with regard to corrective action and, if necessary, soliciting involvement by the QA Program Manager and Program Manager
- Communicating regularly with the Project Manager, QA Program Manager, and Project Chemist to ensure the adherence to QA tasks
- Serving as the main contact for project QA matters, and providing guidance on appropriate procedures to the Project Manager and support personnel
- Conducting laboratory evaluations and audits to ensure that analyses are performed in accordance with the QAPP

#### **2.1.7 PRC Health and Safety Program Manager**

The PRC Health and Safety Program Manager is responsible for developing health and safety standards, implementing health and safety policies, and acting as consultant to management for the Navy CLEAN program. Specific responsibilities include the following:

- Keeping management informed of the status of the Navy CLEAN Health and Safety Program
- Participating in audits to evaluate compliance with the HSP and the health and safety program
- Reviewing site-specific HSPs for technical content and compliance with health and safety program requirements
- Developing, implementing, and assessing the needs of the health and safety program and informing PRC's health and safety coordinators of changes that occur within this program
- Providing consultation on health and safety policy and procedural issues as they relate to the Navy CLEAN Health and Safety Program

#### **2.1.8 U&A Corporate Health and Safety Officer**

The U&A Corporate Health and Safety Officer (CHSO) is responsible for developing, instituting, coordinating, and supervising the project-specific U&A health and safety program. Responsibilities of the U&A CHSO also include:

- Reviewing the site-specific HSP
- Providing assistance to the health and safety Program Manager for health and safety program development, preparing training sessions, conducting accident investigations, and providing recommendations to prevent future accident occurrences
- Ensuring that the HSP complies with federal, state, and local health requirements
- Coordinating with the on-site safety officer on modifications to the HSP and providing consultation to the field team, when required
- Preparing materials to be used in the safety training program and ensuring that the on-site safety officer is knowledgeable in components of the HSP
- Conducting periodic on-site visits to verify that site personnel adhere to the site safety requirements
- Establishing and maintaining communication between the on-site safety officer, Project Manager, and the PRC Health and Safety Program Manager
- Providing guidance on appropriate corrective action procedures to the Project Manager and support personnel

#### **2.1.9 U&A Project Manager**

The project manager is responsible for overseeing all project activities and is ultimately responsible for the timely completion of the project. The responsibilities of the project manager include the following:

- Assigning technical staff
- Ensuring the completion of all QC requirements by team members
- Supervising the document control process
- Preparing the site-specific HSP
- Approving all deliverables and associated documents prior to transmittal to PRC or the Navy
- Establishing and maintaining communication between technical staff, program manager, QA officer, health and safety coordinator, and regulatory agencies
- Implementing all programs and protocols related to the project

### **2.1.10 U&A Site Safety Officer**

The U&A Site Safety Officer (SSO) is responsible for field implementation of the HSP. In addition, the U&A SSO has the following responsibilities:

- Preparing the site-specific HSP
- Correcting and changing site control measures and the required health and safety protection, as required
- Maintaining primary on-site enforcement authority, as delegated by the Project Manager, for the policies and provisions of the health and safety program and the HSP
- Conducting initial and daily safety meetings prior to the initiation of field work
- Verifying that workers on the site are properly trained in health and safety protocols and handling hazardous materials
- Ensuring that everyone at the site knows the route to emergency first aid care and the local hospital
- Ensuring that workers are wearing proper personal protective equipment (PPE) at the site

### **2.1.11 PRC Project Chemist**

The PRC Project Chemist is responsible for the following:

- Ensuring that the laboratory implements the analytical requirements of the QAPP and the FSP
- Ensuring that the laboratory adheres to the PRC "Navy CLEAN II Laboratory Services Statement of Work (PRC SOW)" (PRC 1995)
- Coordinating with the laboratory on project-specific requirements, delivery schedules, and QA/QC matters
- Reviewing laboratory data prior to its release to the data users and the Navy
- Coordinating data validation activities
- Ensuring accuracy of the database entries for sample tracking, laboratory chemical data, and data validation qualifiers

- Providing updates on the project to the QA officer and Project Manager with regard to the QA/QC data

### **2.1.12 U&A Field Project Manager**

The U&A Field Project Manager is responsible for field activities including the following:

- Directing on-site activities, including those of subcontractors
- Ensuring that procedures described in the FSP are adhered to in the field
- Ordering necessary supplies, equipment, and PPE
- Ensuring that field equipment is properly calibrated and maintained
- Ensuring that individual samples are properly handled and documented to allow tracing possession and handling of samples from collection to laboratory receipt
- Acting as the liaison between PRC and Navy personnel on-base during the course of the field work
- Communicating with the PRC Project Chemist on any problems encountered with the collection of samples or the sampling schedule
- Communicating any problems to the U&A and PRC Project Managers in a timely manner

## **2.2 FIELD SAMPLING PERSONNEL TRAINING REQUIREMENTS**

Field personnel scheduled for work at NAS Alameda will be trained in compliance with the Occupational Safety and Health Administration (OSHA) requirements, as found in 29 Code of Federal Regulations (CFR) 1910.120, and will be experienced in hazardous waste site work, use of PPE, and emergency response procedures. The U&A Field Project Manager and SSO will have received the annual 8-hour health and safety refresher training. The U&A Field Project Manager will also have received the 8-hour health and safety training for supervisors. The U&A Field Project Manager and SSO will be current in cardiopulmonary resuscitation (CPR) and first aid training.

Field personnel assigned to the quarterly groundwater monitoring activities for NAS Alameda will receive copies of the MP, FSP, QAPP, and HSP prior to the commencement of sampling activities.

Subcontractors will receive information from the FSP pertaining to field activities, as needed, and will be provided with a copy of the HSP. A field staff orientation and briefing will be held prior to the initiation of field activities and field personnel will sign the Safety Compliance Agreement and Documentation of Site Safety Briefing, as specified in the HSP.

### **3.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA**

DQOs are qualitative and quantitative statements developed by data users to specify the quality of data needed from a particular data collection activity to support specific decisions or regulatory actions. As discussed in Section 5.3 of this QAPP, the DQOs developed for the characterization of NAS Alameda establish whether analytical data will be one of two data categories: screening data or definitive data. Each of these categories is defined by specific QA/QC procedures using a wide range of analytical methods. Following selection of the data category, the appropriate analytical method is selected and measurement objectives are defined. For the characterization of NAS Alameda, both screening and definitive data will be collected in support of the DQOs.

Analytical measurement parameters are the critical indicator of data quality. These parameters are: precision, accuracy, representativeness, completeness, and comparability (PARCC). The following subsections discuss site background and DQOs, data categories, PARCC criteria, and detection and quantitation limits.

#### **3.1 SITE BACKGROUND AND DATA QUALITY OBJECTIVES**

The history of NAS Alameda, a description of the sites, and previous investigations conducted at the sites, are discussed in the Remedial Investigation/Feasibility Study Work Plan Addendum (PRC 1993) and in the FSP, and are not repeated in this QAPP. The overall objective of the sampling activities is to collect the chemical and physical data necessary to further characterize groundwater at NAS Alameda. The specific objectives of this groundwater monitoring program include: collecting groundwater investigative samples to assess potential migration of groundwater contaminants, and sampling on a quarterly basis for one year to monitor potential groundwater contaminant levels over time. Upto one hundred wells (91 on-base wells and potentially 9 off-base wells) will be sampled during each of the four groundwater sampling rounds.

The DQOs for the site characterization of NAS Alameda were developed following the EPA document "Guidance for the Data Quality Objectives Process" (EPA 1994b). Primary DQOs for the characterization of NAS Alameda have been identified as (1) aid in establishing the nature and extent of potential contamination, and (2) provide information for a qualitative risk assessment as part of the remedial investigation (RI).

The DQO process is a series of planning steps based on the scientific method that is designed to ensure that the type, quantity, and quality of environmental data used in decision making is appropriate for the intended application. The EPA DQO process was used to develop the sampling process design presented in Section 5.1 of this QAPP.

## **3.2 DATA CATEGORIES**

The following definitions for screening data and definitive data are from "Data Quality Objectives Process for Superfund Interim Final Guidance" (EPA 1993).

### **Screening Data**

Screening data are data generated by rapid, less precise methods of analysis with less rigorous sample preparation. Screening data provide rapid results for decision making in the field, such as completeness of monitoring well purging prior to groundwater sampling. Screening data provide analyte identification and quantification, although quantification may be relatively imprecise. At least 10 percent of the screening data are confirmed using analytical methods, QA/QC procedures, and criteria associated with definitive data. Screening data without associated confirmation data are not considered to be data of known quality. The minimum QA/QC elements required for the screening data are:

- Sample documentation (location, date and time collected, batch, etc.)
- Chain of custody (when appropriate)
- Sampling design approach (systematic, simple or stratified random, judgmental, etc.)
- Initial and continuing calibration
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) qualification
- Analytical error determination or duplicate precision: an appropriate number of replicate aliquots, as specified in the QAPP and FSP are taken from at least one thoroughly homogenized sample, the replicate aliquots are analyzed, and standard laboratory QC parameters (such as variance, mean, and coefficient of variation or relative percent

difference) are calculated and compared to the method-specific performance requirements specified in the QAPP

- Definitive confirmation: at least 10 percent of the screening data must be confirmed with definitive data as described below; at a minimum, at least three screening samples reported above the action level (if any) and three screening samples reported below the action level (or as non-detects) should be randomly selected from the appropriate group and confirmed

Screening data will only be used for well purging and health and safety monitoring; hence, definitive confirmation will not be necessary. Field screening techniques for the collection of screening data at NAS Alameda are presented in Section 5.3.1 of this QAPP.

### **Definitive Data**

Definitive data are data generated using rigorous analytical methods, such as approved EPA reference methods. Definitive data provide defensible data useable for characterization and assessment purposes. Definitive data are also used to confirm screening data results. Definitive data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined. QA/QC elements required for definitive data include the following:

- Sample documentation (location, date and time collected, batch, etc.)
- Chain of custody (when appropriate)
- Sampling design approach (systematic, simple or stratified random, judgmental, etc.)
- Initial and continuing calibration
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) quantitation
- QC blanks (trip, method, rinsate)

- Matrix spike recoveries
- Performance evaluation (PE) samples (when specified)
- Matrix duplicate: for two or more aliquots this is also referred to as the analytical error determination (measures precision of analytical method); an appropriate number of replicate aliquots, as specified in the QAPP, are taken from at least one thoroughly homogenized sample, the replicate aliquots are analyzed, and standard laboratory QC parameters are calculated and compared to the method-specific performance requirements defined in the QAPP
- Field duplicates or total measurement error determination (measures overall precision of measurement system, from sample acquisition through analysis): an appropriate number of co-located samples are independently collected from the same location and analyzed following standard operating procedures; the variance, mean, coefficient of variation, or relative percent difference are calculated for each matrix under investigation.

Samples that have been selected for definitive data for the groundwater monitoring activities and the alphanumeric codes used to identify the samples are discussed in Section 4.1 of this QAPP; the methods used to obtain the data are discussed in Section 5.3.2.

### 3.3 PARCC CRITERIA

Critical indicators of project data quality are the PARCC parameters (EPA 1987a). PARCC parameters apply to both screening data and definitive data. Measurement objectives for these indicator parameters were developed based on past experience of the project, limitations of the analytical methods or screening techniques, and on the DQOs of the project.

#### 3.3.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under prescribed similar conditions. For duplicate measurements, precision is expressed as the relative percent difference (RPD) of the pair and is calculated using the following equation:

$$RPD = \frac{|D_1 - D_2|}{\frac{1}{2}(D_1 + D_2)} \times 100\%$$

Where:

- $D_1$  = Concentration of analyte in original sample  
 $D_2$  = Concentration of analyte in duplicate sample

The precision of chemical analyses or analytical methods will be assessed through the analysis of matrix spike/matrix spike duplicate (MS/MSD) samples and matrix duplicate samples. Each QC sample type will provide unique information regarding the precision of the laboratory programs, as described below:

- MS/MSD samples: Laboratory analytical precision for organic analyses
- Matrix duplicate samples: Laboratory analytical precision for inorganic/physical parameters

Precision acceptance criteria for duplicate and MS/MSD samples for analytical methods are presented in Tables 3-1 through 3-4. Groundwater duplicate samples will be collected during each of the four groundwater sampling events at NAS Alameda. The precision for field measurements will be evaluated based on the results of duplicate measurements. At least 10 percent of the field measurements will be obtained in duplicate.

When analytes are present in samples either near the method detection limit or substantially above the detection limit, the precision objectives may not be appropriate. If precision objectives are not met, other QC data will be evaluated to assess the validity of the data.

### 3.3.2 Accuracy

Accuracy refers to the degree of agreement of a measurement to its true value. The accuracy of an analytical measurement is impacted by errors introduced through the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analytical techniques. Sampling accuracy will be evaluated based on the result of the analysis of field blanks, trip blanks, and equipment rinsate blanks. To evaluate laboratory accuracy, a program of sample spiking will be conducted by the analytical laboratory. This program includes the analysis of MS/MSD samples, laboratory control samples (LCS) or blank spikes, and surrogate standards, and method blanks. MS/MSD samples are performed at a frequency of 5 percent; LCS or blank spike at a frequency of 5 percent; and surrogate standards, where applicable, are added to every sample analyzed for organic constituents. The results of spiked samples will be expressed as percent recovery and will provide information on positive

and negative bias. Accuracy acceptance criteria for matrix spike samples and surrogate standards, expressed in percent recovery, for the definitive data analytical methods are presented in Tables 3-1 through 3-4. QC measurements are evaluated during data validation.

Accuracy is expressed in terms of percent recovery and is calculated by the following equation:

$$\text{Percent Recovery} = \frac{(\text{Measured Spike Value} - \text{Unspiked Value})}{(\text{Known Spiked Value})} \times 100\%$$

### **3.3.3 Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represent the characteristics of a population, parameter variations at a sampling point, or an environmental condition they are intended to represent. Representativeness is a qualitative parameter; hence no specific criteria must be met. For this project, representative data will be obtained through the careful selection of sampling sites and analytical parameters, the proper collection and handling of samples to avoid interferences and minimize sample contamination and loss of analytes, and the consistent application of standardized field and laboratory procedures. To aid in the evaluation of the representativeness of each sample, field and laboratory required method blank samples will be evaluated for the presence of contaminants. Method blank samples will be considered in evaluating the validity of the data when there are problems with contamination in any samples.

### **3.3.4 Completeness**

Completeness is defined as the percentage of measurements that are judged valid. The project completeness value will be evaluated at the conclusion of the data validation phase and will be calculated by dividing the number of complete, valid sample results by the total number of sample analyses planned for the project. As described in Section 4.5, the data validation process will assess whether a particular data point is a valid result that is acceptable for all uses, an estimated result that is acceptable for limited uses, or a rejected result that is unacceptable for any use. Complete results will be defined as results that

are considered valid and include estimated results. Sample results that are considered rejected, unacceptable, and unusable when compared to QC criteria will be listed as incomplete.

The completeness objective for the characterization of NAS Alameda is 90 percent for definitive data.

### **3.3.5 Comparability**

Comparability is a qualitative parameter that expresses the confidence with which one data set may be compared to another. This goal is achieved through the use of standardized techniques to collect and analyze samples, and the use of appropriate units to report analytical results. These techniques are described in the FSP and throughout this QAPP. Analytical laboratories performing work for the Navy must comply with the PRC SOW for laboratory services (PRC 1995) which specifies analytical protocols, QC criteria, and standard deliverables, thereby promoting comparable data.

## **3.4 DETECTION AND QUANTITATION LIMITS**

The instrument detection limit is the statistical determination of the minimum concentration of an analyte that can be distinguished from the normal electronic "noise" of an analytical instrument. The quantitation limit is the lowest concentration at which an analyte can be accurately and reproducibly quantified. Quantitation limits will vary depending on instrument sensitivity and sample matrix effects. Contract required detection limits (CRDL) and contract required quantitation limits (CRQL) are the minimum quantitation limits that are contractually required for analyses performed under the EPA contract laboratory program (CLP). Metals analyzed using CLP methods are required to be reported to the CRDL. Volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and organochlorine pesticides/polychlorinated biphenyls (PCB) analyzed by CLP methods are required to be reported to the CRQL but also reported to the laboratory's instrument detection limits which are lower. Quantitation limits for other analyses are reported to the quantitation limits specified in the PRC SOW for laboratory services (PRC 1995). The detection limits and quantitation limits for NAS Alameda site characterization are listed in Table 3-5 for analyses of definitive data.

TABLE 3-1

**VOLATILE ORGANIC COMPOUNDS - CLP METHOD  
MATRIX SPIKE AND SURROGATE SPIKE RECOVERY LIMITS  
NAVAL AIR STATION, ALAMEDA**

Matrix Spike Compound	Water	
	% Recovery	RPD
1,1-Dichloroethene	61-145	14
Trichloroethene	71-120	14
Chlorobenzene	75-130	13
Toluene	76-125	13
Benzene	76-127	11

Surrogate Spike Compound	Water	
	% Recovery	
Toluene-d8	88-110	
Bromofluorobenzene	86-115	
1,2-Dichloroethane-d4	76-114	

Notes:

CLP      Contract Laboratory Program  
RPD      Relative Percent Difference

TABLE 3-2

**SEMIVOLATILE ORGANIC COMPOUNDS - CLP METHOD  
MATRIX SPIKE AND SURROGATE SPIKE RECOVERY LIMITS  
NAVAL AIR STATION, ALAMEDA**

Analyte	Water	
	% R	RPD
1,2,4-Trichlorobenzene	39-98	28
Acenaphthene	46-118	31
2,4-Dinitrotoluene	24-96	38
Pyrene	26-127	31
N-Nitroso-di-n-propylamine	41-116	38
1,4-Dichlorobenzene	36-97	28
Pentachlorophenol	9-103	50
Phenol	12-110	42
2-Chlorophenol	27-123	40
4-Chloro-3-methylphenol	23-97	42
4-Nitrophenol	10-80	50

Surrogate Spike Compound	Water
	% Recovery
Nitrobenzene-d5	35-114
2-Fluorobiphenyl	43-116
Terphenyl-d14	33-141
Phenol-d5	10-110
2-Fluorophenol	21-110
2,4,6-Tribromophenol	10-123
2-Chlorophenol-d4	33-110a
1,2-Dichlorobenzene-d4	16-110a

Notes:

CLP    Contract Laboratory Program  
 %R    Percent recovery  
 RPD    Relative percent difference  
 a       These limits are advisory only

TABLE 3-3

**ORGANOCHLORINE PESTICIDES/  
POLYCHLORINATED BIPHENYLS - CLP METHOD  
MATRIX SPIKE AND SURROGATE SPIKE RECOVERY LIMITS  
NAVAL AIR STATION, ALAMEDA**

Matrix Spike Analyte	Water	
	% Recovery	RPD
Gamma-BHC (Lindane)	56-123	15
Heptachlor	40-131	20
Aldrin	40-120	22
Dieldrin	52-126	18
Endrin	56-121	21
4-4'-DDT	38-127	27

Surrogate Spike Compound	Water	
	% Recovery	
Tetrachloro-m-xylene	60-150	
Decachlorobiphenyl	60-150	

## Notes:

BHC     Benzene Hexachloride  
 CLP     Contract Laboratory Program  
 DDT     Dichlorodiphenyltrichloroethane  
 RPD     Relative Percent Difference

TABLE 3-4

**CLP INORGANICS AND OTHER MISCELLANEOUS ANALYTES  
MATRIX SPIKE AND SURROGATE SPIKE ACCURACY AND PRECISION LIMITS  
NAVAL AIR STATION, ALAMEDA**

Matrix Spike Analyte	Water	
	% Recovery	RPD
Metals	75-125	25
Total Dissolved Solids	75-125	25
Nitrate/Nitrite-N	75-125	25
Common Anions	75-125	25
Sulfide	75-125	25
Alkalinity	75-125	25
Total Organic Carbon	75-125	25
Total Extractable Petroleum Hydrocarbons (TEPH)	40-140	50
Total Purgable Petroleum Hydrocarbons (TPPH)	60-140	50

Surrogate Spike Compound	Water
	% Recovery
Surrogate Spike Compound (TPPH)	75-125
Surrogate Spike Compound (TEPH)	60-140

## Notes:

CLP      Contract Laboratory Program  
 RPD      Relative Percent Difference  
 TPPH    Total Purgable Petroleum Hydrocarbons  
 TEPH    Total Extractable Petroleum Hydrocarbons

TABLE 3-5

**CONTRACT REQUIRED REPORTING LIMITS  
NAVAL AIR STATION, ALAMEDA  
(Page 1 of 8)**

<b>Volatile Organic Compounds by CLP SOW Contract Required Quantitation Limits</b>	
<b>Analyte</b>	<b>Water (µg/L)</b>
Chloromethane	2
Bromomethane	2
Vinyl chloride	0.5
Chloroethane	2
Methylene chloride	2
Acetone	2
Carbon disulfide	2
1,1-Dichloroethene	2
1,1-Dichloroethane	2
1,2-Dichloroethene	2
Chloroform	2
1,2-Dichloroethane	0.5
2-Butanone	2
1,1,1-Trichloroethane	2
Carbon tetrachloride	0.5
Bromodichloromethane	2
1,2-Dichloropropane	2
cis-1,3-Dichloropropene	2
Trichloroethene	2
Dibromochloromethane	2
1,1,2-Trichloroethane	2
Benzene	1
trans-1,3-Dichloropropene	0.5
Bromoform	2
4-Methyl-2-pentanone	2
2-Hexanone	2
Tetrachloroethene	2
Toluene	2
1,1,2,2-Tetrachloroethane	2
Chlorobenzene	2
Ethylbenzene	2
Styrene	2
Total Xylenes	2

TABLE 3-5

**CONTRACT REQUIRED REPORTING LIMITS  
NAVAL AIR STATION, ALEMEDA  
(Page 2 of 8)**

<b>Semivolatile Organic Compounds by CLP SOW Contract Required Quantitation Limits</b>	
<b>Analyte</b>	<b>Water (µg/L)</b>
Phenol	10
Bis(2-Chlorethyl)ether	10
2-Chlorophenol	10
1,3-Dichlorobenzene	5
1,4-Dichlorobenzene (µg/L)	5
1,2-Dichlorobenzene (µg/L)	5
2-Methylphenol	10
2,2-Oxybis(1-Chloropropane)	10
4-Methylphenol	10
N-Nitroso-di-n-propylamine	10
Hexachloroethane	10
Nitrobenzene	10
Isophorone	10
2-Nitrophenol	10
2,4-Dimethylphenol	10
Bis(2-Chloroethoxy)methane	10
2,4-Dichlorophenol	10
1,2,4-Trichlorobenzene	10
Naphthalene	10
4-Chloroaniline	10
Hexachlorobutadiene	10
2-Methylnaphthalene	10
Hexachlorocyclopentadiene	10
2,4,6-Trichlorophenol	10
2,4,5-Trichlorophenol	25
2-Chloronaphthalene	10
2-Nitroaniline	25
Dimethylphthalate	10
Acenaphthylene	10
2,6-Dinitrotoluene	10
3-Nitroaniline	25
Acenaphthene	10
2,4-Dinitrophenol	25

TABLE 3-5

**CONTRACT REQUIRED REPORTING LIMITS  
NAVAL AIR STATION, ALAMEDA  
(Page 3 of 8)**

<b>Semivolatile Organic Compounds by CLP SOW Contract Required Quantitation Limits</b>	
<b>Analyte</b>	<b>Water (µg/L)</b>
4-Nitrophenol	25
Dibenzofuran	10
2,4-Dinitrotoluene	10
Diethylphthalate	10
4-Chlorophenyl-phenylether	10
Fluorene	10
4-Nitroaniline	25
4,6-Dinitro-2-methylphenol	25
N-nitrosodiphenylamine	10
4-Bromophenyl-phenylether	10
Hexachlorobenzene	10
Pentachlorophenol	25
Phenanthrene	10
Anthracene	10
Carbazole	10
Di-n-butylphthalate	10
Fluoranthene	10
Pyrene	10
Butylbenzylphthalate	10
3,3-Dichlorobenzidine	10
Benzo(a)anthracene	10
Chrysene	10
Bis(2-ethylhexyl)phthalate	4
Di-n-octylphthalate	10
Benzo(b)fluoranthene	10
Benzo(k)fluoranthene	10
Benzo(a)pyrene	10
Indeno(1,2,3-cd)pyrene	10
Dibenz(a,h)anthracene	10
Benzo(g,h,i)perylene	10

TABLE 3-5

**CONTRACT REQUIRED REPORTING LIMITS**  
**NAVAL AIR STATION, ALAMEDA**  
(Page 4 of 8)

Total Petroleum Hydrocarbons by CLP SOW Contract Required Quantitation Limits		
Analyte	Water (mg/L)	EPA Method
Total purgable petroleum hydrocarbons reported as:		
Gasoline	0.05	Modified 8015
Total extractable petroleum hydrocarbons reported as:		
Diesel	0.1	Modified 8015
Kerosene	0.1	Modified 8015
Motor Oil	0.1	Modified 8015
JP-5	0.1	Modified 8015

TABLE 3-5

**CONTRACT REQUIRED REPORTING LIMITS  
NAVAL AIR STATION, ALAMEDA  
(Page 5 of 8)**

<b>Organochlorine Pesticides and PCBs by CLP SOW Contract Required Quantitation Limits</b>	
<b>Analyte</b>	<b>Water (µg/L)</b>
α-BHC	0.05
β-BHC	0.05
δ-BHC	0.05
γ-BHC (Lindane)	0.05
Heptachlor	0.05
Aldrin	0.05
Heptachlor epoxide	0.05
Endosulfan I	0.05
Dieldrin	0.10
4,4'-DDE	0.10
Endrin	0.10
Endosulfan II	0.10
4,4'-DDD	0.10
Endosulfan sulfate	0.10
4,4'-DDT	0.10
Methoxychlor	0.50
Endrin ketone	0.10
Endrin Aldehyde	0.10
α-Chlordane	0.05
γ-Chlordane	0.05
Toxaphene	5.0
Aroclor 1016	1.0
Aroclor 1221	2.0
Aroclor 1232	1.0
Aroclor 1242	1.0
Aroclor 1248	1.0
Aroclor 1254	1.0
Aroclor 1260	1.0

TABLE 3-5

**CONTRACT REQUIRED REPORTING LIMITS  
NAVAL AIR STATION, ALAMEDA  
(Page 6 of 8)**

Metals by CLP SOW Contract Required Detection Limits	
Analyte	Water (µg/L)
Aluminum	50b
Antimony	6b
Arsenic	10
Barium	200
Beryllium	4b
Cadmium	5
Calcium	5,000
Chromium	10
Cobalt	50
Copper	4.9b
Iron	100
Lead	3
Magnesium	5,000
Manganese	15
Mercury	0.2
Molybdenum	10
Nickel	8.3b
Potassium	5,000
Selenium	5
Silver	2.3b
Sodium	5,000
Thallium	2b
Vanadium	50
Zinc	20

TABLE 3-5

**CONTRACT REQUIRED REPORTING LIMITS  
NAVAL AIR STATION, ALAMEDA  
(Page 7 of 8)**

<b>Non-CLP Methods Contract Required Detection Limits</b>	
<b>Analyte</b>	<b>Water (mg/L)</b>
Alkalinity	5.0
Nitrate as Nitrogen	0.05
Nitrite as Nitrogen	0.05
Total Dissolved Solids (TDS)	10.0
Chloride	0.50
Sulfate	0.50
Fluoride	0.50
Ortho-phosphate-p	0.05
Total Organic Carbon (TOC)	1.0

## Notes:

µg/L	micrograms per liter
BHC	Benzene hexachloride
CLP	Contract Laboratory Program
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
mg/L	Milligrams per liter
SOW	Statement of Work
TDS	Total Dissolved Solids
TOC	Total Organic Carbon

**TABLE 3-5**

**CONTRACT REQUIRED REPORTING LIMITS  
NAVAL AIR STATION, ALEMEDA  
(Page 8 of 8)**

Notes:

- <sup>a</sup> CRQL of 1.0 mg/L was requested by the California Department of Toxic Substances Control (DTSC) to meet current California and San Francisco Bay area water quality standards.
- <sup>b</sup> CRDLs were requested by the California DTSC and the San Francisco Bay RWQCB to meet current California and San Francisco Bay area water quality standards.
- CRQL Contract Required Quantitation Limit
- CRDL Contract Required Detection Limit

## 4.0 DOCUMENTATION AND RECORDS

This section describes the field documentation requirements for the proposed field activities at NAS Alameda and summarizes the overall sample identification and handling, including containers and holding times, shipment to the laboratory, and the documentation, validation, and reporting of the analytical results.

### 4.1 SAMPLE IDENTIFICATION

Samples will be identified to provide a means of tracking each sample from collection through analysis, data reduction, reporting, and validation. A field identification system and a laboratory identification system have been established for NAS Alameda to efficiently manage sample tracking, sample referencing, and to provide a means of submitting blind samples to the laboratory. The following subsections describe sample identification procedures in detail.

#### 4.1.1 Field Identification System

Samples will be assigned a unique and easily transcribed identification number based on an alpha-numeric code. This number, which will be used by field personnel but will not be submitted to the laboratory, will facilitate the reporting of information about a specific site or sample. The number will be based on a two-part alpha/numeric code (three-part for QC samples), as described in the following examples:

<u>Monitoring Well Number</u>	<u>Sequential Quarter Number</u>
M04-05	Q10
Trip-01	Q10

The first set of four to six letters, "M04-05" or "Trip-01", will convey the monitoring well number or the sample type ("Trip" indicates a trip blank) and a sequence number (01) for QC samples.

The sequential number for each quarter (Q10 in the examples above) designates which quarterly sampling event a sample is associated with. The second quarter samples will be designated with a "Q20"; third quarter samples will be designated with a "Q30" and so on.

This number will facilitate the reporting of information about a specific site or sample and will provide for chain of custody (COC) control from the time of sample collection through shipping, analysis, and reporting. Table 4-1 summarizes the sample identification numbers and the analyses to be conducted for the groundwater monitoring activities. Each sample container will be labeled immediately after the sample is obtained. Sample label information will include:

#### **4.1.2 Laboratory Identification System**

Each sample will be assigned a unique identifier, apart from the field identification number, to provide a means of submitting the samples blind to the laboratory. The number will be based on a three-part alpha/numeric code, as described in the following example:

<u>CTO Number</u>	<u>Site Code</u>	<u>Sample Number</u>
108	S04	001
108	S00	001

The first set of three numbers, "108", represents CTO number 0108, under which the field work and sample analyses will be performed. The second set of numbers and/or letters, "S04" and "S00", references the site from which the samples are collected. In this case, "S04" represents NAS Alameda, Site 4, and "S00" represents no site for QC samples that are not associated with any site. The last set of numbers represent an arbitrary sample number, sequentially assigned to each sample, including any field QC samples. This number will be used to cross reference the field identification number. Table 4-1 shows, by quarter, the sequential laboratory identification numbers and corresponding field identification numbers, along with the analytical methods to be performed by the laboratory for each sample.

#### **4.2 SAMPLE HANDLING**

Sample handling procedures described in this section include appropriate sample containers and labeling, custody seals, COCs, sample preservation and holding times, and sample packaging and shipping. Table 4-2 summarizes these elements for this project.

#### **4.2.1 Sample Containers and Labels**

Aqueous samples will be collected in glass or polyethylene containers. The contracted laboratory will provide clean containers with caps which meet EPA CLP container guidelines for CLP methods and appropriate EPA method guidelines for non-CLP methods.

A sample label will be affixed to each sample container sent to the laboratory. The sample label will be completed in indelible ink and will include the following information:

- Name and address of the analytical laboratory
- Project name and location (NAS Alameda)
- Site name
- Sample identification number
- Sampling date and time
- Analyses requested
- Sample matrix (water)
- Filtering (if applicable)
- Preservative used ("N/A" if none used)
- Sampler's initials

After the label has been affixed to the sample container, the label will be covered with a wide strip of clear strapping tape to protect it from moisture damage during shipment and storage.

#### **4.2.2 Custody Seals**

To ensure that no tampering occurs, U&A will place custody seals on each cooler used to ship samples. Custody seals used during the course of the project will consist of security tape with the date and initials of the sampler. Two seals will be placed on each cooler so that they must be broken to gain access to the contents. Clear tape will be placed over the custody seals to protect them from accidental breakage.

#### **4.2.3 Chain of Custody**

COC procedures provide an accurate written record that traces the possession of individual samples from the time of field collection through laboratory analysis. A sample is considered in custody if it meets one of the following criteria:

- In a person's possession
- In view after having been in physical custody
- In a secure within an ice chest sealed with custody seals area after having been in physical custody
- In a designated secure area to which access is restricted to authorized personnel

A COC record will be used to document the samples collected and the analyses requested. Information that field personnel will record on the COC record will include the following:

- Project name and number
- Name and signature of sampler(s)
- Destination of samples (name of laboratory)
- Laboratory identification number
- Date and time of sample collection
- Sample designation (grab or composite)
- Sampling location
- Signatures of personnel involved in custody transfer (including date and time of transfer)
- Airbill number, if applicable
- Number and size of containers
- Preservatives used ("N/A" if not applicable)
- Sample matrix
- Analyses required

- Contract number (in upper left corner)

Unused lines on the COC record will be crossed out. COC records initiated in the field will be signed, placed in a plastic resealable bag, and taped to the inside of the shipping container used for sample transport. Signed airbills will serve as evidence of custody transfer between the field sampler and courier, and between the courier and the laboratory. Copies of the COC record and the airbill will be retained and filed by the sampler prior to shipment.

Upon receipt of an ice chest or shipping container, laboratory personnel will review the contents and will sign and retain the COC record and the airbill. Information that will be recorded on the COC record in the remarks column or on another appropriate document at the time of sample receipt will include the following, as appropriate:

- Status of custody seals
- Temperature of ice chest upon receipt
- Identification number of broken sample containers, if any
- Description of discrepancies between the COC record, sample labels, and requested analyses
- Observations of visible headspace in VOC sample bottles, indicating inadequate sample collection

Laboratory personnel will contact the PRC Project Chemist regarding discrepancies in paperwork and sample preservation, and will document nonconformances and corrective actions in accordance with laboratory SOPs. After samples have been accepted by the laboratory, checked, and logged in, they will be maintained in a manner consistent with custody and security requirements specified in the EPA CLP SOW and the PRC SOW for laboratory services (PRC 1995). Specific laboratory COC procedures are described in an SOP that is available in laboratory files, as required by the CLP.

#### **4.2.4 Sample Preservation and Holding Times**

Several of the chemical parameters to be measured in the laboratory are not chemically stable under some conditions. In these cases, sample preservation is required. Methods of sample preservation are relatively limited and are generally intended to (1) retard biological degradation, (2) retard chemical

degradation, and (3) reduce container adsorption effects. The proposed groundwater samples will be preserved by refrigeration, in accordance with appropriate EPA method protocols for CLP and non-CLP methods.

Upon receipt of the samples from the shipping company, the laboratory will make every effort to analyze all samples within the specified holding times for each analytical method. The field team will coordinate sample shipments with the laboratory to reduce the possibility of these analyses exceeding the specified holding times. Table 4-2 lists holding times for analytical methods.

#### **4.2.5 Sample Packaging and Shipping**

Groundwater samples collected at NAS Alameda will be identified as environmental samples for the purpose of shipment. Environmental samples are defined as water that is not saturated with product material. Department of Transportation (DOT) regulations will be followed for packaging and shipment. The following procedures, which are taken from EPA guidance on field operations methods (EPA 1987b), meet these DOT requirements.

- An ice chest will be lined with a large plastic bag. After the bag is in place, the ice chest will be filled with sample bottles that have been wrapped in bubble-wrap plastic. Any additional space between bottles will be filled with Styrofoam, starch peanuts, or shredded paper. Sufficient packing material will be used to prevent sample containers from making contact during shipment. Sufficient bagged ice or blue ice will be added to the samples to maintain the ice chest at a temperature of 4°C during shipping. The large plastic bag will be securely taped shut to prevent leakage.
- COC records will be sealed in plastic bags and taped to the inside of the ice chest lid.
- The ice chest will be closed and taped shut with filament-type strapping tape on both ends. If the ice chest contains a drain, the drain will be taped closed both inside and outside.
- The ice chest will be custody-sealed by placing a short length of custody tape across the opening of the ice chest lid at two places, one on the front and one on the side of the ice chest. The custody tape will then be signed and dated.
- An airbill will be prepared and affixed to the lid of the ice chest. The ice chest may then be handed over to the specified overnight carrier, such as Federal Express or United Parcel Service, for shipment.

No samples will be held on site for more than 24 hours, except when weekend sampling occurs. Samples collected on weekends will be refrigerated and shipped on the next available working day.

### **4.3 SAMPLE DOCUMENTATION**

Sampling activities conducted during the field work require several forms of documentation to maintain sample identification, COC, and to record significant events or observations. Field personnel are responsible for accurately reporting data in the appropriate field documents. Required documentation will include the use of logbooks and other field forms such as sample registers, field sampling forms, and daily field progress reports.

#### **4.3.1 Logbooks**

Logbooks are hardbound notebooks in which activities associated with the field investigation will be thoroughly described. Logbooks are intended to provide sufficient information to reconstruct events occurring during the field project. Project logbooks consist of the site logbook and the field logbook. The site logbook is kept by the U&A field team leader and is used as a directory. The field logbook is more task-specific, containing general information regarding drilling and sampling activities, and is kept by the U&A rig geologist or other field team member. In the site logbook, the U&A field team leader will record which field logbook contains the task-specific information. The general information to be recorded within the site logbook includes, at a minimum, the following:

- Summary of daily activities, including information presented at the daily safety meeting
- Equipment on site
- Descriptions of deviations from the FSP
- Address and contact information
- Personnel on site
- Weather
- Sampling and shipping summary
  - Airbill number

- COC record number
- Sample destination
- Time of pickup

Specific information to be recorded in the field logbook during sampling activities includes the following:

- Stop and start times for sampling activities at each location
- Description of any problems encountered during sampling at each location
- Description of deviations from the SAP
- Name of the U&A geologist or U&A engineer performing the sampling
- Photoionization detector (PID) readings and calibration data
- Depth to groundwater at each location

Other observations may be included as appropriate.

#### **4.3.2 Field Change Request Forms**

Field change request forms provide a written record documenting proposed changes to project plan documents including the monitoring plan, the FSP, the HSP, and/or the QAPP. Any request will include the rationale for the proposed change and the anticipated impact of the deviation. The form will be signed by appropriate project personnel, including the U&A field team leader, the health and safety officer, and the PRC Project Manager. Approval of the change by the Navy may be required before changes to the field program are implemented.

#### **4.3.3 Daily Field Progress Reports**

A daily field progress report will be submitted by field personnel to the PRC Project Manager each day during field activities. The report will include a discussion of the following topics:

- Date

- Weather, including approximate temperature and approximate wind speed and direction
- Personnel performing site activities
- Visitors to the site
- Work performed
- Sampling performed, including specifics
- QC activities initiated
- Level of health and safety protection
- Problems encountered and corrective actions taken
- Next day's anticipated work schedule
- Signature of individual completing the report

The field personnel are responsible for completely reporting data in the appropriate field documentation. Field documentation will be maintained in the following types of documents: field log books, sample labels, COC forms, and field data sheets for recording sampling activities, geological operations, and field calibration and maintenance data. A sample register will be generated prior to the field sampling event. The sample identification will be assigned based on proposed sampling locations.

#### **4.4            LABORATORY DOCUMENTATION**

The laboratory will provide data packages in accordance with the Navy CLEAN II Laboratory Services SOW (PRC 1995). The data package will include two copies of a summary data package containing the following:

- Case narrative
- Copies of nonconformance/corrective action forms
- COC forms
- Tracking documents
- Sample results

- QA/QC summaries

The data package will also include requirements for a full data package that includes the following:

- Sample raw data
- QC raw data
- Standard raw data
- Instrument raw data
- Other raw data

#### **4.5 DATA VALIDATION AND QUALITY CONTROL SUMMARY REPORTS**

Data validation is the process by which the laboratory data package, or sample delivery group (SDG), is technically evaluated by a party independent of the laboratory.

The laboratory will analyze samples in SDGs that consist of no more than 20 samples each. The validation reviewer will prepare a validation narrative for each SDG. Each validation narrative will contain a list of the samples in the SDG, the analyses performed, the identity of the samples receiving full validation, and the results of validation for each methodology.

During data validation, the validation reviewer will complete worksheets that document the criteria reviewed. These worksheets will be used to generate the validation narrative. The worksheets are part of the complete data validation report that will be kept on file in PRC's Sacramento office.

Once the analytical data have been received from the laboratory and the data validation has been performed, a quality control summary report (QCSR) will be prepared.

The QCSR summarizes the data validation reports, the project goals, the PARCC criteria, and evaluates the ability of the analytical data to support the project DQOs. The QCSR will include the following information:

- Tabulated, validated data tables

- Data validation narratives
- Evaluation of PARCC criteria

The QCSR is intended to provide a general overview of data quality and the data validation reports. Specific details may be found in the data validation narratives which will be included in an appendix to the QCSR.

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES**

**NAVAL AIR STATION, ALAMEDA**

(Page 1 of 20)

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 01 - Quarter 1</b>															
M028-E	108-S01-001	M028-E-Q10	Water	X	X	--	X	X	X	X	X	X	X	X	X
M028-E*	108-S01-002	M028-E-Q10D	Water	X	X	--	X	X	X	--	--	--	--	--	--
M003-E	108-S01-003	M003-E-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M031-E	108-S01-004	M031-E-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M030-E	108-S01-005	M030-E-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M033-A	108-S01-006	M033-A-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M034-A	108-S01-007	M034-A-Q10	Water	X	X	--	X	X	X	X	X	X	X	X	X
M035-A	108-S01-008	M035-A-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-C	108-S01-009	M028-C-Q10	Water	X	--	--	X	X	X	X	X	X	X	X	X
M001-E	108-S01-010	M001-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
M002-E	108-S01-011	M002-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
M027-E	108-S01-012	M027-E-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-A	108-S01-013	M028-A-Q10	Water	X	X	--	X	X	X	X	X	X	X	X	X
M028-E	108-S01-014	M028-E-Q10	Water	X	X	--	X	X	X	X	X	X	X	X	X
M029-E	108-S01-015	M029-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
<b>Site 02 - Quarter 1</b>															
M010-A	108-S02-001	M010-A-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M013-A	108-S02-002	M013-A-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M017-A	108-S02-003	M017-A-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M019-E	108-S02-004	M019-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
M019-E*	108-S02-005	M019-E-Q10	Water	X	X	--	X	--	--	--	--	--	--	--	--
M021-E	108-S02-006	M021-E-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M023-E	108-S02-007	M023-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
M024-A	108-S02-008	M024-A-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
M024-E	108-S02-009	M024-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
M036-A	108-S02-010	M036-A-Q10	Water	X	X	X	X	--	--	X	X	X	--	X	X
M036-B	108-S02-011	M036-B-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M036-E	108-S02-012	M036-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
M037-A	108-S02-013	M037-A-Q10	Water	X	X	X	X	--	--	X	X	X	--	X	X
M037-B	108-S02-014	M037-B-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES**

**NAVAL AIR STATION, ALAMEDA**

(Page 2 of 20)

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 02 (Continued) - Quarter 1</b>															
M037-E	108-S02-015	M037-E-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-A	108-S02-016	M038-A-Q10	Water	X	X	X	X	--	--	X	X	X	--	X	X
M038-B	108-S02-017	M038-B-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-B*	108-S02-018	M038-B-Q10D	Water	X	--	--	X	--	--	--	--	--	--	--	--
M038-E	108-S02-019	M038-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
M039-A	108-S02-020	M039-A-Q10	Water	X	X	X	X	--	--	X	X	X	--	X	X
M039-B	108-S02-021	M039-B-Q10	Water	X	--	--	X	--	--	X	X	X	--	X	X
M039-E	108-S02-022	M039-E-Q10	Water	X	X	--	X	--	--	X	X	X	--	X	X
<b>Site 03 - Quarter 1</b>															
M03-04	108-S03-001	M03-04-Q10	Water	X	--	--	X	X	X	X	X	X	X	X	X
M03-05	108-S03-002	M03-05-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M03-07	108-S03-003	M03-07-Q10	Water	X	--	--	X	X	X	X	X	X	X	X	X
<b>Site 04 - Quarter 1</b>															
M04-05	108-S04-001	M04-05-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M04-06	108-S04-002	M04-06-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M04-07	108-S04-003	M04-07-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
D04-03	108-S04-004	D04-03-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-1	108-S04-005	MW360-1-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-2	108-S04-006	MW360-2-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-3	108-S04-007	MW360-3-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-4	108-S04-008	MW360-4-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
MW360-4*	108-S04-009	MW360-4-Q10D	Water	X	--	--	X	--	--	--	--	--	--	--	--
<b>Site 05 - Quarter 1</b>															
M05-11	108-S05-001	M05-06-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-12	108-S05-002	M05-07-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-01	108-S05-003	M05-08-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-02	108-S05-004	M05-09-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-03	108-S05-005	M05-10-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-04	108-S05-006	D05-01-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 3 of 20)

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 05 (Continued) - Quarter 1</b>															
M05-05	108-S05-007	D05-02-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-06	108-S05-008	M05-06-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-07	108-S05-009	M05-07-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-08	108-S05-010	M05-08-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-09	108-S05-011	M05-09-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05-10	108-S05-012	M05-10-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
D05-02	108-S05-013	D05-02-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
D05-02*	108-S05-014	D05-02-Q10D	Water	X	--	--	X	--	--	--	--	--	--	--	--
M05HW-01	108-S05-015	M05HW-01-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M05BS-01	108-S05-016	M05B5-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
<b>Site 06 - Quarter 1</b>															
M06-06	108-S06-001	M06-06-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
<b>Site 07 - Quarter 1</b>															
M07A-09	108-S07-001	M07A-09-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
D07A-02	108-S07-002	D7A-02-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M07A-03	108-S07-003	MW7A-03-Q10	Water	X	--	--	X	X	X	X	X	X	X	X	X
W1	108-S07-004	W1-07A-Q10	Water	X	--	--	X	X	X	X	X	X	X	X	X
W1*	108-S07-005	W1-07A-Q10D	Water	X	--	--	X	X	X	--	--	--	--	--	--
M07A-04	108-S07-006	M02A-04-Q10	Water	X	--	--	X	X	X	X	X	X	X	X	X
<b>Site 09 - Quarter 1</b>															
M09-06	108-S09-001	M09-06-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
M09-06*	108-S09-002	M09-06-Q10D	Water	X	--	--	X	--	--	--	--	--	--	--	--
D09-01	108-S09-003	D09-01-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X
<b>Site 10 - Quarter 1</b>															
M10-01	108-S10-001	M10-01-Q10	Water	X	--	--	X	--	--	X	X	X	X	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 4 of 20)

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 11 - Quarter 1</b>															
M11-05	108-S11-001	M11-05-Q10	Water	X	—	—	X	—	—	X	X	X	X	X	X
M11-06	108-S11-002	M11-06-Q10	Water	X	—	—	X	—	—	X	X	X	X	X	X
M11-01	108-S11-003	M11-01-Q10	Water	X	—	—	X	—	—	X	X	X	X	X	X
M11-02	108-S11-004	M11-02-Q10	Water	X	—	—	X	—	—	X	X	X	X	X	X
M11-02*	108-S11-005	M11-02-Q10D	Water	X	—	—	X	—	—	—	—	—	—	—	—
<b>Site 12 - Quarter 1</b>															
M12-01	108-S12-001	M12-01-Q10	Water	X	—	—	X	—	—	X	X	X	X	X	X
<b>Site 13 - Quarter 1</b>															
M13-06	108-S13-001	M13-06-Q10	Water	X	X	—	X	X	X	X	X	X	X	X	X
M13-09	108-S13-002	M13-09-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X
MW0R-5	108-S13-003	MW0R-5-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X
MW0R-5*	108-S13-004	MW0R-5-Q10D	Water	X	—	—	X	X	X	—	—	—	—	—	—
<b>Site 14 - Quarter 1</b>															
M101-A	108-S14-001	M101-A-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X
<b>Site 16 - Quarter 1</b>															
M16-04	108-S16-001	M16-04-Q10	Water	X	—	—	X	—	—	X	X	X	X	X	X
M16-04*	108-S16-002	M16-04-Q10D	Water	X	—	—	X	—	—	—	—	—	—	—	—
<b>Site 19 - Quarter 1</b>															
MWD13-3	108-S19-001	MWD13-3-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X
<b>Site 21 - Quarter 1</b>															
M07B-01	108-S21-001	M07B-01-Q10	Water	X	—	—	X	—	—	X	X	X	X	X	X
<b>Site 22 - Quarter 1</b>															
M07C-07	108-S22-001	M07C-07-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X
M07C-08	108-S22-002	M07C-08-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X
D07C-01	108-S22-003	D07C-01-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X
MW547-4	108-S22-004	MW547-4-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 5 of 20)

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 23 - Quarter 1</b>															
D10B-02	108-S23-001	D10B-01-Q10	Water	X	—	—	X	—	—	X	X	X	X	X	X
M530-2	108-S23-002	M530-2-Q10	Water	X	—	—	X	X	X	X	X	X	X	X	X
<b>Background Well - Quarter 1</b>															
MBG-3	108-SBG-001	MBG-3-Q10	Water	X	X	X	X	X	X	X	X	X	X	X	X
<b>Off Site Wells - Quarter 1</b>															
CW-1	108-CW-001	CW-1-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-2	108-CW-002	CW-2-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-3	108-CW-003	CW-3-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-4	108-CW-004	CW-4-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-5	108-CW-005	CW-5-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-5*	108-CW-006	CW-5-Q10D	Water	—	—	—	X	—	—	—	—	—	—	—	—
CW-6	108-CW-007	CW-6-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-7	108-CW-008	CW-7-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-8	108-CW-009	CW-8-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-9	108-CW-010	CW-9-Q10	Water	—	—	—	X	—	—	X	X	X	X	X	X
<b>QC Samples (Trip Blanks) - Quarter 1</b>															
Trip Blank	108-S00-001	Trip-01-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-002	Trip-02-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-003	Trip-03-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-004	Trip-04-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-005	Trip-05-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-006	Trip-06-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-007	Trip-07-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-008	Trip-08-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-009	Trip-09-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-010	Trip-10-Q10	Water	X	—	—	—	—	—	—	—	—	—	—	—

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 6 of 20)

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 01 - Quarter 2</b>															
M028-E	108-S01-016	M028-E-Q20	Water	X	X	--	X	X	X	X	X	X	--	X	X
M028-E*	108-S01-017	M028-E-Q20D	Water	X	X	--	X	X	X	--	--	--	--	--	--
M003-E	108-S01-018	M003-E-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M031-E	108-S01-019	M031-E-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M030-E	108-S01-020	M030-E-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M033-A	108-S01-021	M033-A-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M034-A	108-S01-022	M034-A-Q20	Water	X	X	--	X	X	X	X	X	X	--	X	X
M035-A	108-S01-023	M035-A-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-C	108-S01-024	M028-C-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
M001-E	108-S01-025	M001-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
M002-E	108-S01-026	M002-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
M027-E	108-S01-027	M027-E-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-A	108-S01-028	M028-A-Q20	Water	X	X	--	X	X	X	X	X	X	--	X	X
M028-E	108-S01-029	M028-E-Q20	Water	X	X	--	X	X	X	X	X	X	--	X	X
M029-E	108-S01-030	M029-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
<b>Site 02 - Quarter 2</b>															
M010-A	108-S02-023	M010-A-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M013-A	108-S02-024	M013-A-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M017-A	108-S02-025	M017-A-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M019-E	108-S02-026	M019-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
M019-E*	108-S02-027	M019-E-Q20	Water	X	X	--	X	--	--	--	--	--	--	--	--
M021-E	108-S02-028	M021-E-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M023-E	108-S02-029	M023-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
M024-A	108-S02-030	M024-A-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
M024-E	108-S02-031	M024-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
M036-A	108-S02-032	M036-A-Q20	Water	X	X	X	X	--	--	X	X	X	--	X	X
M036-B	108-S02-033	M036-B-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M036-E	108-S02-034	M036-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
M037-A	108-S02-035	M037-A-Q20	Water	X	X	X	X	--	--	X	X	X	--	X	X
M037-B	108-S02-036	M037-B-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 02 (Continued) - Quarter 2</b>															
M037-E	108-S02-037	M037-E-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-A	108-S02-038	M038-A-Q20	Water	X	X	X	X	--	--	X	X	X	--	X	X
M038-B	108-S02-039	M038-B-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-B*	108-S02-040	M038-B-Q20D	Water	X	--	--	X	--	--	--	--	--	--	--	--
M038-E	108-S02-041	M038-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
M039-A	108-S02-042	M039-A-Q20	Water	X	X	X	X	--	--	X	X	X	--	X	X
M039-B	108-S02-043	M039-B-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M039-E	108-S02-044	M039-E-Q20	Water	X	X	--	X	--	--	X	X	X	--	X	X
<b>Site 03 - Quarter 2</b>															
M03-04	108-S03-004	M03-04-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
M03-05	108-S03-005	M03-05-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M03-07	108-S03-006	M03-07-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 04 - Quarter 2</b>															
M04-05	108-S04-010	M04-05-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M04-06	108-S04-011	M04-06-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M04-07	108-S04-012	M04-07-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
D04-03	108-S04-013	D04-03-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-1	108-S04-014	MW360-1-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-2	108-S04-015	MW360-2-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-3	108-S04-016	MW360-3-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-4	108-S04-017	MW360-4-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-4*	108-S04-018	MW360-4-Q20D	Water	X	--	--	X	--	--	--	--	--	--	--	--
<b>Site 05 - Quarter 2</b>															
M05-11	108-S05-017	M05-06-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-12	108-S05-018	M05-07-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-01	108-S05-019	M05-08-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-02	108-S05-020	M05-09-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-03	108-S05-021	M05-10-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-04	108-S05-022	D05-01-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 05 (Continued) - Quarter 2</b>															
M05-05	108-S05-023	D05-02-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-06	108-S05-024	M05-06-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-07	108-S05-025	M05-07-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-08	108-S05-026	M05-08-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-09	108-S05-027	M05-09-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-10	108-S05-028	M05-10-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
D05-02	108-S05-029	D05-02-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
D05-02*	108-S05-030	D05-02-Q20D	Water	X	--	--	X	--	--	--	--	--	--	--	--
M05HW-01	108-S05-031	M05HW-01-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05BS-01	108-S05-032	M05B5-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 06 - Quarter 2</b>															
M06-06	108-S06-002	M06-06-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 07 - Quarter 2</b>															
M07A-09	108-S07-007	M07A-09-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
D07A-02	108-S07-008	D7A-02-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M07A-03	108-S07-009	MW7A-03-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
W1	108-S07-010	W1-07A-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
W1*	108-S07-011	W1-07A-Q20D	Water	X	--	--	X	X	X	--	--	--	--	--	--
M07A-04	108-S07-012	M02A-04-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 09 - Quarter 2</b>															
M09-06	108-S09-004	M09-06-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M09-06*	108-S09-005	M09-06-Q20D	Water	X	--	--	X	--	--	--	--	--	--	--	--
D09-01	108-S09-006	D09-01-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 10 - Quarter 2</b>															
M10-01	108-S10-002	M10-01-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 11 - Quarter 2</b>															
M11-05	108-S11-006	M11-05-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-06	108-S11-007	M11-06-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-01	108-S11-008	M11-01-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES**

**NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 11 (Continued) - Quarter 2</b>															
M11-02	108-S11-009	M11-02-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-02*	108-S11-010	M11-02-Q20D	Water	X	--	--	X	--	--	--	--	--	--	--	--
<b>Site 12 - Quarter 2</b>															
M12-01	108-S12-002	M12-01-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 13 - Quarter 2</b>															
M13-06	108-S13-005	M13-06-Q20	Water	X	X	--	X	X	X	X	X	X	--	X	X
M13-09	108-S13-006	M13-09-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
MWOR-5	108-S13-007	MWOR-5-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
MWOR-5*	108-S13-008	MWOR-5-Q20D	Water	X	--	--	X	X	X	--	--	--	--	--	--
<b>Site 14 - Quarter 2</b>															
M101-A	108-S14-002	M101-A-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 16 - Quarter 2</b>															
M16-04	108-S16-003	M16-04-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M16-04*	108-S16-004	M16-04-Q20D	Water	X	--	--	X	--	--	--	--	--	--	--	--
<b>Site 19 - Quarter 2</b>															
MWD13-3	108-S19-002	MWD13-3-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 21 - Quarter 2</b>															
M07B-01	108-S21-002	M07B-01-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 22 - Quarter 2</b>															
M07C-07	108-S22-005	M07C-07-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
M07C-08	108-S22-006	M07C-08-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
D07C-01	108-S22-007	D07C-01-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
MW547-4	108-S22-008	MW547-4-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 23 - Quarter 2</b>															
D10B-02	108-S23-003	D10B-01-Q20	Water	X	--	--	X	--	--	X	X	X	--	X	X
M530-2	108-S23-004	M530-2-Q20	Water	X	--	--	X	X	X	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES**

**NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Background Well - Quarter 2</b>															
MBG-3	108-SBG-002	MBG-3-Q20	Water	X	X	X	X	X	X	X	X	X	—	X	X
<b>Off Site Wells - Quarter 2</b>															
CW-1	108-CW-011	CW-1-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-2	108-CW-012	CW-2-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-3	108-CW-013	CW-3-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-4	108-CW-014	CW-4-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-5	108-CW-015	CW-5-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-5*	108-CW-016	CW-5-Q20D	Water	—	—	—	X	—	—	—	—	—	—	—	—
CW-6	108-CW-017	CW-6-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-7	108-CW-018	CW-7-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-8	108-CW-019	CW-8-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-9	108-CW-020	CW-9-Q20	Water	—	—	—	X	—	—	X	X	X	X	X	X
<b>QC Samples (Trip Blanks) - Quarter 2</b>															
Trip Blank	108-S00-011	Trip-01-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-012	Trip-02-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-013	Trip-03-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-014	Trip-04-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-015	Trip-05-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-016	Trip-06-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-017	Trip-07-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-018	Trip-08-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-019	Trip-09-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-020	Trip-10-Q20	Water	X	—	—	—	—	—	—	—	—	—	—	—

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 01 - Quarter 3</b>															
M028-E	108-S01-031	M028-E-Q30	Water	X	X	--	X	X	X	X	X	X	--	X	X
M028-E*	108-S01-032	M028-E-Q30D	Water	X	X	--	X	X	X	--	--	--	--	--	--
M003-E	108-S01-033	M003-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M031-E	108-S01-034	M031-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M030-E	108-S01-035	M030-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M033-A	108-S01-036	M033-A-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M034-A	108-S01-037	M034-A-Q30	Water	X	X	--	X	X	X	X	X	X	--	X	X
M035-A	108-S01-038	M035-A-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-C	108-S01-039	M028-C-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
M001-E	108-S01-040	M001-E-Q30	Water	X	X	--	X	--	--	X	X	X	--	X	X
M002-E	108-S01-041	M002-E-Q30	Water	X	X	--	X	--	--	X	X	X	--	X	X
M027-E	108-S01-042	M027-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-A	108-S01-043	M028-A-Q30	Water	X	X	--	X	X	X	X	X	X	--	X	X
M028-E	108-S01-044	M028-E-Q30	Water	X	X	--	X	X	X	X	X	X	--	X	X
M029-E	108-S01-045	M029-E-Q30	Water	X	X	--	X	--	--	X	X	X	--	X	X
<b>Site 02 - Quarter 3</b>															
M010-A	108-S02-045	M010-A-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M013-A	108-S02-046	M013-A-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M017-A	108-S02-047	M017-A-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M019-E	108-S02-048	M019-E-Q30	Water	X	X	--	X	--	--	X	X	X	--	X	X
M019-E*	108-S02-049	M019-E-Q30	Water	X	X	--	X	--	--	--	--	--	--	--	--
M021-E	108-S02-050	M021-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M023-E	108-S02-051	M023-E-Q30	Water	X	X	--	X	--	--	X	X	X	--	X	X
M024-A	108-S02-052	M024-A-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M024-E	108-S02-053	M024-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M036-A	108-S02-054	M036-A-Q30	Water	X	--	X	X	--	--	X	X	X	--	X	X
M036-B	108-S02-055	M036-B-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M036-E	108-S02-056	M036-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M037-A	108-S02-057	M037-A-Q30	Water	X	--	X	X	--	--	X	X	X	--	X	X
M037-B	108-S02-058	M037-B-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES**

**NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 02 (Continued) - Quarter 3</b>															
M037-E	108-S02-059	M037-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-A	108-S02-060	M038-A-Q30	Water	X	--	X	X	--	--	X	X	X	--	X	X
M038-B	108-S02-061	M038-B-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-B*	108-S02-062	M038-B-Q30D	Water	X	--	--	X	--	--	--	--	--	--	--	--
M038-E	108-S02-063	M038-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M039-A	108-S02-064	M039-A-Q30	Water	X	--	X	X	--	--	X	X	X	--	X	X
M039-B	108-S02-065	M039-B-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M039-E	108-S02-066	M039-E-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 03 - Quarter 3</b>															
M03-04	108-S03-007	M03-04-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
M03-05	108-S03-008	M03-05-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M03-07	108-S03-009	M03-07-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 04 - Quarter 3</b>															
M04-05	108-S04-019	M04-05-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M04-06	108-S04-020	M04-06-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M04-07	108-S04-021	M04-07-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
D04-03	108-S04-022	D04-03-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-1	108-S04-023	MW360-1-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-2	108-S04-024	MW360-2-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-3	108-S04-025	MW360-3-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-4	108-S04-026	MW360-4-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-4*	108-S04-027	MW360-4-Q30D	Water	X	--	--	X	--	--	--	--	--	--	--	--
<b>Site 05 - Quarter 3</b>															
M05-11	108-S05-033	M05-06-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-12	108-S05-034	M05-07-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-01	108-S05-035	M05-08-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-02	108-S05-036	M05-09-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-03	108-S05-037	M05-10-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-04	108-S05-038	D05-01-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES**

**NAVAL AIR STATION, ALAMEDA**

(Page 13 of 20)

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 05 (Continued) - Quarter 3</b>															
M05-05	108-S05-039	D05-02-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-06	108-S05-040	M05-06-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-07	108-S05-041	M05-07-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-08	108-S05-042	M05-08-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-09	108-S05-043	M05-09-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-10	108-S05-044	M05-10-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
D05-02	108-S05-045	D05-02-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
D05-02*	108-S05-046	D05-02-Q30D	Water	X	--	--	X	--	--	--	--	--	--	--	--
M05HW-01	108-S05-047	M05HW-01-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05BS-01	108-S05-048	M05B5-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 06 - Quarter 3</b>															
M06-06	108-S06-003	M06-06-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 07 - Quarter 3</b>															
M07A-09	108-S07-013	M07A-09-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
D07A-02	108-S07-014	D7A-02-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M07A-03	108-S07-015	MW7A-03-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
W1	108-S07-016	W1-07A-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
W1*	108-S07-017	W1-07A-Q30D	Water	X	--	--	X	X	X	--	--	--	--	--	--
M07A-04	108-S07-018	M02A-04-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 09 - Quarter 3</b>															
M09-06	108-S09-007	M09-06-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M09-06*	108-S09-008	M09-06-Q30D	Water	X	--	--	X	--	--	--	--	--	--	--	--
D09-01	108-S09-009	D09-01-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 10 - Quarter 3</b>															
M10-01	108-S10-003	M10-01-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 11 - Quarter 3</b>															
M11-05	108-S11-011	M11-05-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-06	108-S11-012	M11-06-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 11 (Continued) - Quarter 3</b>															
M11-01	108-S11-013	M11-01-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-02	108-S11-014	M11-02-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-02*	108-S11-015	M11-02-Q30D	Water	X	--	--	X	--	--	--	--	--	--	--	--
<b>Site 12 - Quarter 3</b>															
M12-01	108-S12-003	M12-01-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 13 - Quarter 3</b>															
M13-06	108-S13-009	M13-06-Q30	Water	X	X	--	X	X	X	X	X	X	--	X	X
M13-09	108-S13-010	M13-09-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
MW0R-5	108-S13-011	MW0R-5-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
MW0R-5*	108-S13-012	MW0R-5-Q30D	Water	X	--	--	X	X	X	--	--	--	--	--	--
<b>Site 14 - Quarter 3</b>															
M101-A	108-S14-003	M101-A-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 16 - Quarter 3</b>															
M16-04	108-S16-005	M16-04-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M16-04*	108-S16-006	M16-04-Q30D	Water	X	--	--	X	--	--	--	--	--	--	--	--
<b>Site 19 - Quarter 3</b>															
MWD13-3	108-S19-003	MWD13-3-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 21 - Quarter 3</b>															
M07B-01	108-S21-003	M07B-01-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 22 - Quarter 3</b>															
M07C-07	108-S22-009	M07C-07-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
M07C-08	108-S22-010	M07C-08-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
D07C-01	108-S22-011	D07C-01-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
MW547-4	108-S22-012	MW547-4-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 23 - Quarter 3</b>															
D10B-02	108-S23-005	D10B-01-Q30	Water	X	--	--	X	--	--	X	X	X	--	X	X
M530-2	108-S23-006	M530-2-Q30	Water	X	--	--	X	X	X	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES**

**NAVAL AIR STATION, ALAMEDA**

**(Page 15 of 20)**

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Background Well - Quarter 3</b>															
MBG-3	108-SBG-003	MBG-3-Q30	Water	X	X	X	X	X	X	X	X	X	—	X	X
<b>Off Site Wells - Quarter 3</b>															
CW-1	108-CW-021	CW-1-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-2	108-CW-022	CW-2-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-3	108-CW-023	CW-3-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-4	108-CW-024	CW-4-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-5	108-CW-025	CW-5-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-5*	108-CW-026	CW-5-Q30D	Water	—	—	—	X	—	—	—	—	—	—	—	—
CW-6	108-CW-027	CW-6-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-7	108-CW-028	CW-7-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-8	108-CW-029	CW-8-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
CW-9	108-CW-030	CW-9-Q30	Water	—	—	—	X	—	—	X	X	X	X	X	X
<b>QC Samples (Trip Blanks) - Quarter 3</b>															
Trip Blank	108-S00-021	Trip-01-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-022	Trip-02-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-023	Trip-03-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-024	Trip-04-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-025	Trip-05-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-026	Trip-06-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-027	Trip-07-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-028	Trip-08-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-029	Trip-09-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—
Trip Blank	108-S00-030	Trip-10-Q30	Water	X	—	—	—	—	—	—	—	—	—	—	—

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 01 - Quarter 4</b>															
M028-E	108-S01-046	M028-E-Q40	Water	X	X	--	X	X	X	X	X	X	--	X	X
M028-E*	108-S01-047	M028-E-Q40D	Water	X	X	--	X	X	X	X	X	X	--	X	X
M003-E	108-S01-003	M003-E-Q40	Water	X	--	--	X	--	--	--	--	--	--	--	--
M031-E	108-S01-004	M031-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M030-E	108-S01-005	M030-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M033-A	108-S01-006	M033-A-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M034-A	108-S01-007	M034-A-Q40	Water	X	X	--	X	X	X	X	X	X	--	X	X
M035-A	108-S01-008	M035-A-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-C	108-S01-009	M028-C-Q40	Water	X	--	--	X	X	X	X	X	X	--	X	X
M001-E	108-S01-010	M001-E-Q40	Water	X	X	--	X	--	--	X	X	X	--	X	X
M002-E	108-S01-011	M002-E-Q40	Water	X	X	--	X	--	--	X	X	X	--	X	X
M027-E	108-S01-012	M027-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M028-A	108-S01-013	M028-A-Q40	Water	X	X	--	X	X	X	X	X	X	--	X	X
M028-E	108-S01-014	M028-E-Q40	Water	X	X	--	X	X	X	X	X	X	--	X	X
M029-E	108-S01-015	M029-E-Q40	Water	X	X	--	X	--	--	X	X	X	--	X	X
<b>Site 02 - Quarter 4</b>															
M010-A	108-S02-067	M010-A-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M013-A	108-S02-068	M013-A-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M017-A	108-S02-069	M017-A-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M019-E	108-S02-070	M019-E-Q40	Water	X	X	--	X	--	--	X	X	X	--	X	X
M019-E*	108-S02-071	M019-E-Q40	Water	X	X	--	X	--	--	--	--	--	--	--	--
M021-E	108-S02-072	M021-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M023-E	108-S02-073	M023-E-Q40	Water	X	X	--	X	--	--	X	X	X	--	X	X
M024-A	108-S02-074	M024-A-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M024-E	108-S02-075	M024-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M036-A	108-S02-076	M036-A-Q40	Water	X	--	X	X	--	--	X	X	X	--	X	X
M036-B	108-S02-077	M036-B-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M036-E	108-S02-078	M036-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M037-A	108-S02-079	M037-A-Q40	Water	X	--	X	X	--	--	X	X	X	--	X	X
M037-B	108-S02-080	M037-B-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M037-E	108-S02-081	M037-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 02 - Quarter 4 (Continued)</b>															
M038-A	108-S02-082	M038-A-Q40	Water	X	--	X	X	--	--	X	X	X	--	X	X
M038-B	108-S02-083	M038-B-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M038-B*	108-S02-084	M038-B-Q40D	Water	X	--	--	X	--	--	--	--	--	--	--	--
M038-E	108-S02-085	M038-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M039-A	108-S02-086	M039-A-Q40	Water	X	--	X	X	--	--	X	X	X	--	X	X
M039-B	108-S02-087	M039-B-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M039-E	108-S02-088	M039-E-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 03 - Quarter 4</b>															
M03-04	108-S03-010	M03-04-Q40	Water	X	--	--	X	X	X	X	X	X	--	X	X
M03-05	108-S03-011	M03-05-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M03-07	108-S03-012	M03-07-Q40	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 04 - Quarter 4</b>															
M04-05	108-S04-028	M04-05-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M04-06	108-S04-029	M04-06-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M04-07	108-S04-030	M04-07-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
D04-03	108-S04-031	D04-03-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-1	108-S04-032	MW360-1-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-2	108-S04-033	MW360-2-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-3	108-S04-034	MW360-3-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-4	108-S04-035	MW360-4-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
MW360-4*	108-S04-036	MW360-4-Q40D	Water	X	--	--	X	--	--	--	--	--	--	--	--
<b>Site 05 - Quarter 4</b>															
M05-11	108-S05-049	M05-06-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-12	108-S05-050	M05-07-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-01	108-S05-051	M05-08-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-02	108-S05-052	M05-09-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-03	108-S05-053	M05-10-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-04	108-S05-054	D05-01-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-05	108-S05-055	D05-02-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-06	108-S05-056	M05-06-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 05 - Quarter 4 (Continued)</b>															
M05-07	108-S05-057	M05-07-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-08	108-S05-058	M05-08-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-09	108-S05-059	M05-09-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05-10	108-S05-060	M05-10-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
D05-02	108-S05-061	D05-02-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
D05-02*	108-S05-062	D05-02-Q40D	Water	X	--	--	X	--	--	--	--	--	--	--	--
M05HW-01	108-S05-063	M05HW-01-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M05BS-01	108-S05-064	M05B5-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 06 - Quarter 4</b>															
M06-06	108-S06-004	M06-06-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 07 - Quarter 4</b>															
M07A-09	108-S07-019	M07A-09-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
D07A-02	108-S07-020	D7A-02-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M07A-03	108-S07-021	MW7A-03-Q40	Water	X	--	--	X	X	X	X	X	X	--	X	X
W1	108-S07-022	W1-07A-Q40	Water	X	--	--	X	X	X	X	X	X	--	X	X
W1*	108-S07-023	W1-07A-Q40D	Water	X	--	--	X	X	X	--	--	--	--	--	--
M07A-04	108-S07-024	M02A-04-Q40	Water	X	--	--	X	X	X	X	X	X	--	X	X
<b>Site 09 - Quarter 4</b>															
M09-06	108-S09-010	M09-06-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M09-06*	108-S09-011	M09-06-Q40D	Water	X	--	--	X	--	--	--	--	--	--	--	--
D09-01	108-S09-012	D09-01-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 10 - Quarter 4</b>															
M10-01	108-S10-004	M10-01-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
<b>Site 11 - Quarter 4</b>															
M11-05	108-S11-016	M11-05-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-06	108-S11-017	M11-06-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-01	108-S11-018	M11-01-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-02	108-S11-019	M11-02-Q40	Water	X	--	--	X	--	--	X	X	X	--	X	X
M11-02*	108-S11-020	M11-02-Q40D	Water	X	--	--	X	--	--	--	--	--	--	--	--

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

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Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Site 12 - Quarter 4</b>															
M12-01	108-S12-004	M12-01-Q40	Water	X	—	—	X	—	—	X	X	X	—	X	X
<b>Site 13 - Quarter 4</b>															
M13-06	108-S13-013	M13-06-Q40	Water	X	X	—	X	X	X	X	X	X	—	X	X
M13-09	108-S13-014	M13-09-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
MW0R-5	108-S13-015	MW0R-5-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
MW0R-5*	108-S13-016	MW0R-5-Q40D	Water	X	—	—	X	X	X	—	—	—	—	—	—
<b>Site 14 - Quarter 4</b>															
M101-A	108-S14-004	M101-A-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
<b>Site 16 - Quarter 4</b>															
M16-04	108-S16-007	M16-04-Q40	Water	X	—	—	X	—	—	X	X	X	—	X	X
M16-04*	108-S16-008	M16-04-Q40D	Water	X	—	—	X	—	—	—	—	—	—	—	—
<b>Site 19 - Quarter 4</b>															
MWD13-3	108-S19-004	MWD13-3-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
<b>Site 21 - Quarter 4</b>															
M07B-01	108-S21-004	M07B-01-Q40	Water	X	—	—	X	—	—	X	X	X	—	X	X
<b>Site 22 Quarter 4</b>															
M07C-07	108-S22-013	M07C-07-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
M07C-08	108-S22-014	M07C-08-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
D07C-01	108-S22-015	D07C-01-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
MW547-4	108-S22-016	MW547-4-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
<b>Site 23 - Quarter 4</b>															
D10B-02	108-S23-007	D10B-01-Q40	Water	X	—	—	X	—	—	X	X	X	—	X	X
M530-2	108-S23-008	M530-2-Q40	Water	X	—	—	X	X	X	X	X	X	—	X	X
<b>Background Well - Quarter 4</b>															
MBG-3	108-SBG-004	MBG-3-Q40	Water	X	X	X	X	X	X	X	X	X	—	X	X

TABLE 4-1

**FIELD AND LABORATORY IDENTIFICATION NUMBERS AND ANALYTES  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

(Page 20 of 20)

Well/ QC ID	Laboratory Identification	Field Identification	Matrix	VOC	SVOC	Pest/ PCB	Metals	TPPH	TEPH	Nitr-N	Anions	TDS	TOC	Sulfide	Alkalinity
<b>Off Site Wells - Quarter 4</b>															
CW-1	108-CW-031	CW-1-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-2	108-CW-032	CW-2-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-3	108-CW-033	CW-3-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-4	108-CW-034	CW-4-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-5	108-CW-035	CW-5-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-5*	108-CW-036	CW-5-Q40D	Water	--	--	--	X	--	--	--	--	--	--	--	--
CW-6	108-CW-037	CW-6-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-7	108-CW-038	CW-7-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-8	108-CW-039	CW-8-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
CW-9	108-CW-040	CW-9-Q40	Water	--	--	--	X	--	--	X	X	X	X	X	X
<b>QC Samples (Trip Blanks) - Quarter 4</b>															
Trip Blank	108-S00-031	Trip-01-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-032	Trip-02-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-033	Trip-03-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-034	Trip-04-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-035	Trip-05-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-036	Trip-06-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-037	Trip-07-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-038	Trip-08-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-039	Trip-09-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	108-S00-040	Trip-10-Q40	Water	X	--	--	--	--	--	--	--	--	--	--	--

**Notes:**

bgs Below ground surface  
 CLP (U.S. EPA) Contract Laboratory Program  
 ID Identification  
 Nitr-N Nitrate/Nitrite-N  
 PCB Polychlorinated biphenyls  
 Pest Pesticides  
 QC Quality control  
 SVOC Semivolatile organic compounds

TDS Total dissolved solids  
 TEPH Total extractable petroleum hydrocarbons  
 TOC Total organic carbon  
 TPPH Total purgable petroleum hydrocarbons  
 VOC Volatile organic compounds  
 X Analysis performed  
 \* Duplicate groundwater samples - Note that the specific wells where duplicate samples are collected will be selected in the field by the sampling team. The wells included in this table are examples only.  
 -- Not analyzed

TABLE 4-2

**CONTAINERS, PRESERVATION, AND HOLDING TIME REQUIREMENTS  
FOR GROUNDWATER AND QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

Parameter	Matrix	Method	Sample Container	Number of Containers	Preservative	Holding Time
<b>Organic Analyses</b>						
Volatile Organic Compounds	Water	CLP SOW	40 ml vials with Teflon-lined cap	3	HCL to pH<2, Cool, 4 °C	14 days
Semivolatile Organic Compounds	Water	CLP SOW	1-liter Amber glass bottle with Teflon-lined cap	2	Cool, 4 °C	7 days to extraction 40 days after extraction
Organochlorine pesticides/ Polychlorinated Biphenyls	Water	CLP SOW	1-liter Amber glass bottle with Teflon lined cap	2	Cool, 4 °C	7 days to extraction; 40 days after extraction
Total Organic Carbon	Water	SM 5310	8-ounce glass jar with Teflon-lined cap	1	Cool, 4 °C	28 days
Total Purgable Petroleum Hydrocarbons	Water	8015 Modified	40 ml vials with Teflon-lined cap	3	HCL to pH<2, Cool, 4 °C	14 days
Total Extractable Petroleum Hydrocarbons	Water	3510/8015 Modified	1-liter Amber glass bottle with Teflon-lined cap	2	Cool, 4 °C	7 days to extraction; 40 days after extraction
<b>Inorganic and General Chemical Analyses</b>						
Metals	Water	CLP SOW	1-liter polyethylene bottle	1	HNO <sub>3</sub> to pH<2, Cool, 4 °C	Mercury 28 days; all others 6 months
Anions	Water	300.0	500ml polyethylene bottle	1	Cool, 4 °C	28 days
Total Dissolved Solids	Water	160.1	1-liter polyethylene or glass bottle	1	Cool, 4 °C	7 days
Sulfide	Water	376.1/376.2	1-liter polyethylene bottle	1	2ml zinc acetate plus NaOH to pH>9, Cool, 4 °C	7 days
Nitrate/Nitrite as Nitrogen	Water	353.2	1-liter polyethylene bottle	1	Cool, 4 °C	48 Hours
Alkalinity	Water	310.1	1-liter polyethylene bottle	1	Cool, 4 °C	14 Days

## Notes:

CLP	U.S. EPA Contract laboratory program
HCL	Hydrochloric acid
HNO <sub>3</sub>	Nitric acid
ml	Mililiter
SM	Standard Methods
SOW	Statement of Work
<	Less than
>	Greater than

## **5.0 MEASUREMENT AND DATA ACQUISITION**

This section discusses sampling process design, sampling method requirements, method requirements by data category, quality control requirements and frequency, instrument and equipment requirements, data acquisition, and data management.

### **5.1 SAMPLING PROCESS DESIGN**

A non-probabilistic (judgmental) sampling design was developed for the NAS Alameda RI when the wells were initially installed. Non-probabilistic sampling involves selecting sample locations based on experience and knowledge of the site (EPA 1993). Non-probabilistic samples can be used subjectively to provide data about specific areas of the site.

Based on existing data and knowledge of the site, upto 100 groundwater monitoring wells (91 wells located on-base and potentially 9 wells located off-base) will be sampled to characterize the area for known or suspected contamination. The sampling approach contains four elements: (1) groundwater samples will be collected from 91 on-base monitoring wells to characterize potential groundwater contamination at NAS Alameda; (2) groundwater sampling will be conducted on a quarterly basis to monitor potential groundwater contaminant levels; (3) one sample will be collected from each of the designated on-base groundwater monitoring wells during each of the four quarterly groundwater sampling rounds, and (4) groundwater samples may be collected from 9 off-base water wells to provide additional data on background water quality and monitor groundwater movement.

The sampling locations were selected to provide supplementary groundwater information for NAS Alameda. The information gained from this investigation (along with previous data) will provide additional groundwater data for the RI at NAS Alameda.

### **5.2 SAMPLING METHOD REQUIREMENTS**

Sampling method requirements are described in detail in the FSP, and are briefly discussed in the following sections.

### **5.2.1 Groundwater Monitoring Well Sampling**

One hundred monitoring wells will be sampled after water level measurements are recorded and each well is properly purged. The purged water will be stored on base in the investigation-derived waste (IDW) area. Four rounds of groundwater sampling are to be conducted over the course of one year to measure potential groundwater contaminant levels. The groundwater samples will be analyzed for the analytes shown in Table 4-1. A PID will be used during well sampling at the wells specified in the HSP to estimate possible organic vapor contamination from the monitoring wells. Groundwater sampling methods are described in the FSP. Information collected during field sampling of groundwater will include depths to groundwater and to the bottom of the well, temperature, conductivity, and pH.

## **5.3 METHOD REQUIREMENTS BY DATA CATEGORY**

Data obtained for the characterization of NAS Alameda fall into two categories: screening data and definitive data. Accuracy goals for sample analyses are presented in Section 3.0 of this QAPP. The following sections describe the methods used to obtain data in each of the data categories.

### **5.3.1 Field Screening Method Requirements**

Screening data will be used for health and safety monitoring purposes, to determine possible contamination, and to ensure complete well development/purging for the acquisition of groundwater samples. PID screening results will be used for health and safety monitoring purposes and to determine possible hydrocarbon contamination of groundwater. The field screening equipment to be used includes a PID, a pH meter, a conductivity meter, and a thermometer. Stabilization of the pH, conductivity, and temperature parameters are necessary to ensure complete well purging prior to groundwater sampling. The following sections briefly describe the methods that will be used to obtain screening data.

#### **5.3.1.1 Photoionization Detector**

The PID will be equipped with an 11.7 electron volt (eV) lamp to maximize the number of target compounds detected on the PID. The field screening will be used as a qualitative technique for determining the presence of volatiles in some of the monitoring wells. A list of the monitoring wells requiring field screening may be found in Table 6-2 of the HSP. The samples used during the field screening process must be equilibrated at roughly the same temperature to provide comparable readings.

The PID measurements will be taken in the breathing zone above the well, or, the zone where an individual may be exposed to the highest concentration of volatile compounds.

#### **5.3.1.2 pH**

Field measurements of the pH for aqueous samples will follow PRC's SOP No. 012 as described in Appendix A of the FSP (Volume IIa of this groundwater monitoring plan). The pH will be measured electrochemically using either a glass electrode, in combination with a reference potential electrode, or a combination electrode. A two-point daily calibration of the pH meters will be performed prior to field analysis using reference standards. The pH is an important parameter for predicting fate and transport of chemicals in groundwater (such as metal speciation and solubility of phenolics).

#### **5.3.1.3 Electrical Conductivity**

Electrical conductivities of aqueous samples will be measured during field activities following PRC's SOP No. 013 as described in Appendix A of the FSP (Volume IIa of this groundwater monitoring plan). The specific conductivity meter will be calibrated prior to use in the field with potassium chloride reference standards. Temperature corrections will be applied during data acquisition following the manufacturer's instructions.

#### **5.3.1.4 Temperature**

The temperatures of aqueous solutions collected during field activities will be measured following PRC's SOP No. 011 as described in Appendix A of the FSP (Volume IIa of this groundwater monitoring plan). Temperature will be measured using a mercury thermometer, thermistor, or a temperature meter. The mercury thermometer is certified factory calibrated. The thermistor and temperature meters will be calibrated against a mercury thermometer. Temperature probes will be rinsed twice with deionized water prior to measurement and between samples.

### **5.3.2 Definitive Data Methods Requirements**

Table 5-1 presents the analytical parameters and methods that will be used for the analysis of groundwater samples collected at NAS Alameda. The following subsections briefly describe the analytical methods that will be used for this project.

#### **5.3.2.1 Volatile Organic Compounds**

VOCs will be measured by a CLP purge-and-trap gas chromatography/ mass spectrometry (GC/MS) method applicable to the determination of purgeable organics in aqueous samples. The CLP VOC target compound list (TCL) will be used and a mass spectral library search will be performed to identify the 30 highest concentration, nontarget compounds in each sample. These compounds are commonly referred to as tentatively identified compounds (TIC). Table 3-5 presents the CRQLs for VOCs.

#### **5.3.2.2 Semivolatile Organic Compounds**

SVOCs will be measured by a CLP GC/MS method applicable to the determination of a number of organic compounds that are partitioned into an organic solvent and are amenable to detection using gas chromatography (GC). Table 3-5 presents the CRQLs for SVOCs. The CLP SVOC TCL will be used and a mass spectral library search will be performed to identify the 30 highest concentration, nontarget compounds in each sample. These compounds are commonly referred to as tentatively identified compounds (TIC).

#### **5.3.2.3 Organochlorine Pesticides and PCBs**

Organochlorine pesticides and PCBs will be measured by a CLP GC method applicable to the determination of certain organochlorine pesticides and PCBs in groundwater. Table 3-5 presents the TCL and the CRQLs for organochlorine pesticides and PCBs analyses.

#### **5.3.2.4 Total Petroleum Hydrocarbons**

Total petroleum hydrocarbons will be analyzed in accordance with the "Leaking Underground Fuel Tank (LUFT) Field Manual" (California State Water Resources Control Board [SWRCB], 1988) and by EPA Method 8015 (EPA 1986), modified for both purgeable and extractable petroleum hydrocarbons. The calibration fuel for purgeable petroleum hydrocarbons will be gasoline. The calibration fuels for extractable petroleum hydrocarbons will be diesel No. 2 and motor oil. In accordance with the PRC SOW for laboratory services (PRC 1995), the laboratory will appropriately flag any chromatograph patterns for samples not conforming to specific retention time windows or pattern recognition criteria for the calibration fuels.

#### **5.3.2.5 Metals**

CLP metals will be analyzed using inductively coupled plasma atomic emission spectroscopy (ICP) and graphite furnace atomic absorption (GFAA). Table 3-5 presents the TCL and the CRQLs for metals analyses.

#### **5.3.2.6 Alkalinity**

Alkalinity will be determined by sample titration to an electrometrically determined endpoint of pH 4.5. Alkalinity is reported in milligrams per liter as calcium carbonate (mg/L CaCO<sub>3</sub>).

#### **5.3.2.7 Ion Chromatography (Common Anions/Nitrate-N and Nitrite-N)**

Ion chromatography will determine the common anions such as chloride, fluoride, phosphate, sulfate, nitrate-N, and nitrite-N.

#### **5.3.2.8 Total Dissolved Solids (TDS)**

For TDS analyses a well mixed sample will be filtered through a standard glass fiber filter, and the filtrate will be evaporated to dryness in a pre-weighed dish and dried to a constant weight at 180 °C. The increase in dishweight represents the total dissolved solids.

#### **5.3.2.9 Total Organic Carbon (TOC)**

Total organic carbon (TOC) in groundwater will be analyzed in accordance with Standard Method 5310B (APHA 1992).

### **5.4 QUALITY CONTROL REQUIREMENTS AND FREQUENCY**

QC checks are instituted to obtain accurate and precise data and to document the quality of the data. These checks cover the field sampling effort and the laboratory analytical work. This section discusses the required QC checks and their frequency (see Table 5-2).

#### **5.4.1 Field Quality Control Samples**

Field QC samples, consisting of trip blanks and field duplicates, will be collected for laboratory analysis to check sampling and analytical accuracy and precision. Collection of these samples is consistent with guidelines presented in the Navy QA requirements (Naval Energy and Environmental Support Activity [NEESA], 1988). Table 5-3 summarizes field QC samples.

##### **5.4.1.1 Trip Blanks**

Trip blanks are laboratory samples of analyte-free water which will be included in the transport container used to ship water samples requiring VOC analysis. Trip blanks will originate at the analytical laboratory, will be shipped to the field, packaged with the investigative samples, and shipped unopened back to the laboratory. Trip blanks will be analyzed for VOCs. They are indicative of the type and level of VOC contamination, if any, introduced during sample shipment from the field and during storage at the laboratory.

##### **5.4.1.2 Field Duplicate Samples**

Field duplicate samples are used to help evaluate the precision of the laboratory data. The duplicate samples will be collected immediately after a groundwater sample is collected using the same groundwater collection technique and equipment but submitted to the laboratory as a separate sample to assess the consistency of the overall sampling and analysis system. Field duplicate samples will be collected, numbered, packaged, and sealed in the same manner as other samples, and submitted blind to the laboratory. Duplicates will be collected at the rate of approximately 10 percent of the groundwater samples and analyzed for the constituents requested in the original sample that provide data in support of risk assessment, including, CLP VOCs, CLP SVOCs, pesticides/PCBs, CLP metals, and TPH constituents. Nitrate as N, anions, TDS, TOC, sulfide, and alkalinity analyses will not be requested for duplicate samples.

#### **5.4.2 Laboratory Quality Control Parameters**

Laboratory QC samples and procedures will be performed at the frequency specified in the referenced method, and as required by the laboratory's specific QA/QC program. These QC samples and procedures may include the following:

- Method blanks
- Matix spike/Matrix spike duplicates
- Matrix duplicates
- Laboratory control samples
- Interference check samples
- Post-digestion spike samples
- Instrument performance check samples
- Internal standards
- Surrogate standards

#### **5.4.3 Field Measurement Quality Control**

Field measurement will be conducted as part of the sampling program. Table 5-3 summarizes the field measurement quality control procedures. These measurements and the associated QC practices will include:

- PID
  - Instrument will be calibrated daily according to the manufacturer's specifications
  - In addition, 5 percent of all measurements will be taken in duplicate
- pH meter
  - Instrument will be calibrated daily according to the manufacturer's specifications
  - In addition, 5 percent of all measurements will be taken in duplicate
- Conductivity meter
  - Instrument will be calibrated daily according to the manufacturer's specifications
  - In addition, 5 percent of all measurements will be taken in duplicate

If the results fail to meet the objectives set for data quality, calibration of the instrument in question will be conducted as described in Section 5.5.1. If the instrument still fails to meet the QC criteria, it will be removed from service and replaced.

## **5.5 INSTRUMENT AND EQUIPMENT TESTING, INSPECTIONS, AND MAINTENANCE REQUIREMENTS**

Hazco, or another qualified supplier, will provide the necessary field equipment, instruments, and supplies for field efforts. Instruments received from the supplier will be inspected, calibrated, and tested prior to use in the field. Included in the supplier's rental agreement will be the appropriate corrective action procedure for inappropriate, damaged, or non-compliant materials or instruments received. Instruments received from the supplier will include the manuals required for correct operation and calibration of the instrument. The calibration, blank, and analytical results will be reported on the field forms. The following sub-sections describe the calibration of instruments and inspection of supplies.

### **5.5.1 Instrument Calibration and Frequency**

Field instruments will be calibrated using the procedures specified in the PRC SOPs discussed in Appendix A of the FSP (Volume IIa of this groundwater monitoring plan), and within the guidelines of the manufacturer's specifications. The frequency varies with different field instruments but, at a minimum, calibration shall be conducted daily.

For analytical laboratory procedures, the analytical instruments must be calibrated within the analytical method requirements specified in the SOPs and, in addition, the PRC SOW (PRC 1995). Calibration information, including date and time, will be logged on the appropriate form, logbook, document, and electronic format. The analytical laboratories will perform and retain documentation of calibration and maintenance of instruments used for the analysis of samples.

### **5.5.2 Inspection and Acceptance Requirements for Supplies and Consumables**

Supplies and consumables to be used in the field will be procured and received prior to mobilizing into the field. Prior to use, the items will be inspected and tested. Any defective material will be replaced prior to the onset of the sampling event.

Sample containers with the appropriate preservatives will be prepared by the analytical laboratory following laboratory procedures. Containers will meet EPA specifications for certified clean containers. Containers and coolers will be inspected prior to use for packing and shipping samples. In addition, containers will be field inspected. Defective material will be replaced prior to the onset of the sampling event.

Appropriate packaging materials (such as bubble-wrap, plastic bags, and tape) will be available for packing samples to avoid breakage during transportation.

## **5.6 DATA ACQUISITION REQUIREMENTS**

Data acquired through the analyses of samples will be reported following formats established by the method, the PRC SOW (PRC 1995), and within the required deliverable schedule. Data from analytical laboratories will be presented in a CLP hard copy or equivalent data package and in the electronic data deliverable (EDD) format detailed in the PRC SOW (PRC 1995).

The EDD is an ASCII file of the results and sample identification information downloaded into a specific file structure from the laboratory information management system. The EDD will be imported into the NAS Alameda database. Data and QC information in the file must be within the limits established by the PRC SOW (PRC 1995) for correct transfer of the data from the laboratory. If an EDD is not correctly structured, the laboratory is required to resubmit the data file in a timely manner.

Field laboratory results will be recorded on the appropriate field forms for data entry into the NAS Alameda database. Data entered into the database, either from field forms or imported from an EDD, will be reviewed for accuracy.

## **5.7 DATA MANAGEMENT**

The following sections outline the project data management scheme.

### **5.7.1 Field Data Management**

The PRC Project Manager will be responsible for the review, transfer, and storage of data collected in the field for NAS Alameda. Documentation of field activities, which includes sampling, logging, and field screening measurements, will be documented by the U&A Field Project Manager as described in Section 4.0. Field change request forms and daily field progress reports will be filed by the PRC Project Manager; copies will be included as an appendix to the final QCSR.

### **5.7.2 Laboratory Data Management**

Upon the receipt of the samples at the laboratory, the laboratory sample custodian will reconcile the information on the COC forms with the sample bottles received. The sample custodian will document any anomalies and report these to the laboratory project manager. Anomalies will be resolved with the PRC project chemist. The information on the COC forms will then be entered into the laboratory's information management system along with the analyses being requested. The proper sample container labels will be generated and attached to the containers.

Data that are acquired through the sample preparation, analysis, and reporting processes will be tracked using the laboratory's information management system. Data will either be transferred from the instrumentation electronically to the laboratory's information management system, or qualified personnel will enter the data through terminals. The laboratory is responsible for tracking QC sample measurements, along with the specific sample results, on a batch basis. Any QC sample measurements that exceed the specified QC limits for the project will be flagged on the data and discussed in the laboratory's case narrative. QC problems which directly impact data quality will immediately be communicated to the PRC project chemist. The laboratory will implement any necessary corrective actions which also will be appropriately documented. After data are collected, reviewed, and approved, the laboratory will generate an EDD and a CLP data package from the laboratory's information management system and deliver them to the PRC project chemist.

The laboratory project manager is responsible for proper sample handling and documentation. The documentation will allow for the tracking of individual samples from the time of receipt by the laboratory or by the laboratory courier, until the submittal of the final data package and electronic deliverable to the PRC project chemist. Laboratory sample receipt deficiency reports and nonconformance memos will be

utilized by the laboratory to document and disseminate non-conformance information to the PRC project chemist.

The laboratory is required to maintain the analytical records for a period of 10 years. Data are stored by a combination of hard copy and computer tapes.

Magnetic tape data will include information directly from the GC or GC/MS systems. Should a data quality problem arise which requires magnetic tape review, the data will be made available to PRC.

### **5.7.3 PRC Data Management**

The laboratory will be responsible for sending a hard copy of the CLP data package and an EDD on computer diskette to the PRC project chemist. Upon the receipt of the data package, the EDD will be imported into the NAS Alameda database. The importing program will check the format and content of the EDD for compliance and comparability with the NAS Alameda database. Any errors reported by the importing program will be thoroughly investigated. If necessary, the laboratory will regenerate the deliverable. The EDD and the hard copy will also be checked for completeness by the project chemist. Any missing data or information will be requested from the laboratory.

Data tables will be printed from the database. A copy of both the data tables and the hard copy data package will be sent to an outside party for data validation, as described in Section 6.4 of this document. The validation will apply qualifiers or comment codes, as appropriate, to data and will mark the data tables for input into the database. The validator will prepare a data validation report and return the data package, marked tables, and data validation report to the PRC project chemist.

The PRC project chemist will perform a technical review of the data validation report as described in Section 6.1.3. The data tables will be submitted to a data entry person for input into the database. The final version of the data validation report will be generated complete with the analytical result tables containing the appropriate qualifiers and comment codes. This complete data validation package will be stored with the raw analytical data. A copy of the validation report narratives will be submitted with the QCSR.

The PRC project chemist will be responsible for the proper handling of the data. At the conclusion of the project, the PRC project chemist will prepare a QCSR in support of the report, which will summarize the overall quality of the data and will assess whether the DQOs were achieved. Hard copy data packages are stored in an off-site storage facility and the final version of the electronic data tables will be archived onto electronic data diskettes for permanent storage.

TABLE 5-1

**LABORATORY ANALYTICAL METHODS  
NAVAL AIR STATION, ALAMEDA**

Parameter	Method	Reference	Analyte List	Technique
<b>Organic Analyses</b>				
Volatile Organic Compounds	CLP SOW	CLP SOW 1994	TCL	GC/MS
Semivolatile Organic Compounds	CLP SOW	CLP SOW 1994	TCL	GC/MS
Organochlorine Pesticides and Polychlorinated Biphenyls	CLP SOW	CLP SOW 1994	TCL	GC/ECD
Total Purgeable Petroleum Hydrocarbons	8015 Modified	EPA 1986	--	GC/FID
Total Extractable Petroleum Hydrocarbons	3510/8015 Modified	EPA 1986	--	GC/FID
<b>Inorganic and General Chemical Analyses</b>				
Metals (Including Mercury)	CLP SOW	CLP SOW 1995	TAL	ICP & AA & GFAA & CVAA
Alkalinity	310.1	EPA 1983	--	Titration
Common Anions	300.0	EPA 1983	--	Ion chromatography
Sulfide	376.1/376.2	EPA 1983	--	Titrimetric/Colorimetric
Nitrate/Nitrite-N	353.2	EPA 1983	--	Cadmium Reduction
Total Dissolved Solids	160.1	EPA 1983	--	Gravimetric
Total Organic Carbon	9060	EPA 1986	--	Carbonaceous Analyzer

## Notes:

AA	Atomic absorption spectroscopy
CLP SOW 1994	EPA Contract Laboratory Program Statement of Work for Organics Analysis
CLP SOW 1995	EPA Contract Laboratory Program Statement of Work for Inorganics Analysis
CVAA	Cold vapor atomic absorption spectroscopy
EPA 1983	Methods for Chemical Analysis of Water and Wastes, March
EPA 1986	Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition
GC	Gas chromatography
GFAA	Graphite furnace atomic absorption spectroscopy
ICP	Inductively coupled plasma emission spectroscopy
MS	Mass spectrometry
SMEWW 1992	Standard Methods for the Examination of Water and Wastewater, 18th Edition (APHA)
TAL	Target analyte list
TCL	Target compound list
--	Not Analyzed

TABLE 5-2

**FIELD AND LABORATORY QUALITY CONTROL SAMPLES  
NAVAL AIR STATION, ALAMEDA**

Sample Type	Frequency of Analysis
Trip Blank	One per cooler when analyzing for VOCs
Field Duplicate (groundwater)	10 percent
Method blanks	One per sample delivery group
Matrix Spike/Matrix Spike Duplicate Pair (organics)	5 percent <sup>a</sup>
Raw Matrix Spike	5 percent <sup>b</sup>
Matrix Duplicate (inorganics)	5 percent <sup>c</sup>
Laboratory Control Sample	One per sample delivery group
Interference Check Sample	One per sample delivery group for metals
Post-digestion Spike Samples	One per sample delivery group for metals
Instrument Performance Check Samples	One per sample delivery group
Internal Standards	All GC/MS samples
Surrogate Standards	All GC/MS samples

## Notes:

- <sup>a</sup> At least one matrix spike (MS)/matrix spike duplicate (MSD) pair will be included with each analytical batch. The sample selected for the MS/MSD pair will be chosen by the field personnel and submitted to the laboratory in triplicate.
- <sup>b</sup> At least one MS will be included with each analytical batch. The sample selected for the MS will be chosen by the field personnel and submitted to the laboratory in duplicate.
- <sup>c</sup> At least one matrix duplicate (MD) will be analyzed with each analytical batch. The sample selected for the MD will be chosen by the laboratory.

GC/MS Gas Chromatography/Mass Spectrometry  
VOC Volatile Organic Compound

**TABLE 5-3**

**FIELD MEASUREMENT QUALITY CONTROL PROCEDURES  
NAVAL AIR STATION, ALAMEDA**

<b>Applicable Parameter</b>	<b>Analytical Method</b>	<b>QC Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action<sup>a</sup></b>
Organic Vapor Monitoring	NA	Calibration verification check	Daily	Response 20% of expected value	Repeat measurement and/or recalibrate
pH	EPA 9040B	pH 4 and pH 10 buffer	At each sampling location	0.1 pH unit	Recalibrate
Conductivity	EPA 120.1	Field duplicate	10% of field samples	5%	Repeat measurement and/or recalibrate
Temperature	EPA 170.1	Field duplicate	10% of field samples	<1.0 °C	Repeat measurement

Notes:

- <sup>a</sup> All corrective actions will be documented, and the records will be maintained by the project manager.
- NA Not Applicable
- QC Quality Control
- < Less than

## **6.0 ASSESSMENT AND OVERSIGHT**

An assessment evaluates the capability and performance of a measurement system or its components and identifies problems warranting correction. This section presents the activities for assessment, response actions, reports to management, and data validation and usability, for the effectiveness of the implementation of the QAPP.

### **6.1 ASSESSMENT**

Assessments projected for the site characterization activities at NAS Alameda include (1) performance evaluations, (2) technical systems audits, (3) technical reviews, and (4) field audits.

#### **6.1.1 Performance Evaluations**

The performance evaluation will include a review of the existing project and QC data to assess the accuracy of a total measurement system or a component of the system. Laboratory performance evaluations are conducted routinely by the Navy and PRC. Internal performance evaluations or audits for the laboratory are described in the laboratory's QA plan.

#### **6.1.2 Technical Systems Audits**

Technical systems audits will be used to verify adherence to QA policies and SOPs. This type of audit may consist of an on-site review of measurement systems including facilities, equipment, and personnel. Additionally, procedures for measurement, QC, and documentation may be evaluated. Technical systems audits will be conducted on a regularly scheduled basis, with the first audit conducted shortly after a system becomes operational.

#### **6.1.3 Technical Reviews**

Technical reviews will be performed by the PRC project chemist for reports and deliverables, including data validation reports and the QCSR. Data validation reports will be reviewed for technical accuracy by a chemist independent from the data validator. The data validation reports will be reviewed for consistency within the project as well as within the overall investigation.

#### **6.1.4 Field Audits**

Field audits will involve an on-site visit by an auditor or auditing team. Field audits will be conducted at the program level rather than the project level. The PRC quality management plan specifies audits to be performed annually. Because the auditors are independent of the Groundwater Monitoring field activities, it is unknown whether the activities planned for NAS Alameda will be audited. Items to be examined include the availability and implementation of approved work procedures; calibration and operation of equipment; packaging, storage, and shipping of samples; documentation of procedures and instructions; and nonconformance documentation. Audits may include evaluating QAPP adherence, training status, health and safety procedures, activity and performance records, budget status, QC data, calibrations, conformance to SOPs, and compliance with laws, regulations, policies, and procedures. If an audit is conducted, an audit report will be prepared which includes a brief description of the activities, an audit summary, required corrective actions, and quality improvement opportunities.

### **6.2 RESPONSE ACTION**

An effective QA program requires prompt and thorough correction of nonconformances affecting quality. Rapid and effective field and laboratory corrective action procedures minimize the possibility of questionable data or documentation. QA problems and corrective actions will be documented to provide a complete record of QA activities.

#### **6.2.1 Field Corrective Action Procedures**

Field corrective action procedures will depend on the severity of the nonconformance. In cases where immediate and complete corrective action may be implemented by field personnel, corrective actions will be recorded in the field logbook and summarized in the daily field progress report and site logbook.

Nonconformances identified during an audit that have a substantial impact on data quality require the completion of a corrective action memo. This memo may be completed by an auditor or any individual who suspects that any aspect of data integrity is being affected by a field nonconformance. The memo shall include a description of the problem and the required corrective action.

Copies of the corrective action memo will be distributed to the PRC and U&A project managers, the U&A field project manager, the PRC QA officer, and the project file. The PRC QA officer will forward the memo to the program manager and the PRC QA program manager as appropriate. Key personnel will meet to discuss the following:

- Determine when and how the problem developed
- Assign responsibility for problem investigation and documentation
- Determine the corrective action needed to eliminate the problem
- Design a schedule for completion of the corrective action
- Assign responsibility for implementing the corrective action
- Document and verify that the corrective action has eliminated the problem

The person identified as responsible for implementing the corrective action shall also be responsible for completing a follow-up memo documenting the completion of the corrective action. The follow-up memo shall be submitted to the PRC QA officer to evaluate that the solution has adequately and permanently corrected the problem. The PRC QA program manager can require data acquisition to be limited or discontinued until the corrective action is complete and the nonconformance eliminated. The PRC QA program manager can also request the reanalysis of any or all data acquired since the system was last in conformance.

#### **6.2.2 Laboratory Corrective Action Procedures**

The internal laboratory corrective action procedures and a description of out-of-control situations requiring corrective action are contained in the laboratory's QA plan. At a minimum, corrective action will be implemented when control chart warning or control limits are exceeded, method QC requirements are not met, or sample holding times are exceeded. Laboratory corrective action procedures require that the laboratory identify out-of-control situations that could result in significant amounts of qualified data and perform a corrective action designed to reduce the amount of qualified data. This corrective action is often the re-analysis of samples once the cause of the out-of-control situation has been identified and corrected. Out-of-control situations will be reported to the PRC project chemist within 2 working days of identification. In addition, a corrective action report, signed by the laboratory director or the PRC and

U&A project managers and the laboratory QC coordinator, will be provided to the PRC project chemist. The corrective action report shall include a description of the problem, the identification of affected samples, and the required corrective action.

### **6.3               REPORTS TO MANAGEMENT**

A summary progress report will be prepared on a monthly basis by the PRC project manager and submitted to the Navy. The report may include the following:

- Audit results, if an audit has been conducted during the reporting period
- Status of the project
- Instrument, equipment, or procedural problems affecting QA and recommended solutions
- Objectives from the previous report that have been achieved
- Objectives from the previous report that have not been achieved
- Work and objectives that have been planned for the following month

This information will also be required from any subcontractors and will be included in PRC's monthly status report.

### **6.4               DATA VALIDATION AND USABILITY**

This section provides an overview of the data validation process and how data usability will be documented. The data validation process ultimately enables reconciliation of the data with the project objectives.

#### **6.4.1           Data Review, Validation, and Verification Requirements**

Through the data validation process, the data will be evaluated for acceptable quality and quantity, based on the critical indicator parameters of PARCC (EPA 1987a). These parameters are discussed in detail in Section 3.3.

Analytical methods for each SDG will be validated on the basis of the criteria listed in the following:

- “U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review” (EPA 1994c)
- “U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review” (EPA 1994d)

Samples in each SDG will receive a cursory validation review and 10 percent of the samples for each of the analyses performed will receive a full validation review. Table 6-1 lists the cursory validation criteria and the full validation criteria.

After the data have been reviewed, data validation qualifiers will be applied to the analytical results. Data validation qualifiers are alphabetical characters that are placed next to each reported value that correspond to QC issues that may have affected the analytical results. Table 6-2 lists data validation qualifiers and their definitions based on functional guidelines (EPA 1994c).

A QCSR will be written by the PRC project chemist. As discussed in Section 4.5 of this document the QCSR will summarize the project goals stated in the DQOs and the PARCC criteria, and how well the analytical data support the DQOs. The QCSR will include the following items:

- Reconciliation of the data with DQOs
- Laboratory data validation summary
- Field screening data summary
- Limitations on the applicability of the data
- Any quality assurance plan modifications from the work plan
- Field audit report
- Any corrective actions performed

The data validation summary will include a brief description of the results of the data validation process for each analytical method. This description will consist of the assessment of data quality in terms of the PARCC criteria. The details of the data validation process for each SDG, along with the validated analytical results, will be included as data validation narratives in an appendix of the QCSR.

The laboratory will submit analytical reports in hard copy and electronic formats. All analytical reports will be submitted with laboratory qualifiers that are defined by either the EPA CLP SOW or the laboratory SOPs. Data submitted with CLP or laboratory-defined qualifiers will identify items such as (1) nondetected values, (2) values below the CRQL (considered estimated values), and (3) values with problems during the analysis. Through data validation, these CLP or laboratory-defined data qualifiers will be evaluated for appropriateness and replaced, as necessary, by the functional guidelines data validation qualifiers listed in Table 6-2 to notify the data user of the validity of the data. A database program created at PRC will be used to transfer data from the laboratory by an ASCII-formatted diskette. This database will allow (1) the data validation qualifiers to be substituted as necessary for the original laboratory qualifiers, (2) correction of detected data errors, (3) other software to be interfaced, and (4) tables to be printed with the validated results in various formats.

In addition to the analytical results with associated qualifiers, the printed tables will also include a comment column. The comment column is used to provide an explanation for any assigned qualifiers. The alphabetical letters "a" through "h" are used in the comment column and are comment codes which reference different QC issues that may have affected the analytical results. Table 6-2 lists the associated definitions for these comment codes. The comment codes on the analytical tables will provide the reader with an immediate explanation for the qualifier attached to the result. The comment code will also enable the reader to locate a detailed discussion of the QC issue in the appropriate data validation narrative.

#### **6.4.2 Reconciliation with Data Quality Objectives**

The PRC project chemist is responsible for data quality. Data quality issues concerning field sampling efforts, laboratory analysis, data validation, database management, and data reporting will be referred to the PRC project chemist. In addition, the PRC project chemist will be responsible for the following data handling procedures:

- Sorting, binding, and tracking of analytical raw data delivered from the laboratory
- Input of EDD into the PRC database and printing initial result tables
- Reconciling sample numbers, field identification numbers, and requested analyses based on the FSP, COC, and data package

- Preparing and shipping SDGs to data validation services
- Performing technical review of the data validation reports
- Inputting data validation qualifiers into the PRC database
- Preparing final data validation report including text, supporting documentation, and final result tables
- Preparing EDD for input into geographical information system

At the conclusion of the project, the PRC project chemist will prepare a QCSR in support of the characterization report, which will summarize the overall quality of the data and help to determine whether the DQOs of the project were met. In addition, any tabular results required for the characterization report will be printed and reviewed for accuracy by the PRC project chemist.

TABLE 6-1

**DATA VALIDATION EVALUATION CRITERIA  
NAVAL AIR STATION, ALAMEDA**

<p><u>CLP Inorganics</u><sup>a</sup></p> <ul style="list-style-type: none"> <li>*Holding times</li> <li>*Calibration (initial and continuing)</li> <li>*Blanks (method, instrument, and preparation blanks) <ul style="list-style-type: none"> <li>Inductively coupled plasma interference check sample</li> </ul> </li> <li>*Laboratory control sample</li> <li>*Duplicate sample analysis</li> <li>*Matrix spike (MS) sample analysis <ul style="list-style-type: none"> <li>Graphite furnace atomic absorption quality control (QC)</li> <li>ICP serial dilution</li> <li>Sample result verification</li> </ul> </li> <li>*Field duplicates</li> <li>*Overall assessment of data for a sample delivery group (SDG)</li> </ul>
<p><u>CLP Organics</u><sup>b</sup></p> <ul style="list-style-type: none"> <li>*Holding times <ul style="list-style-type: none"> <li>Gas chromatograph/mass spectrometer tuning</li> </ul> </li> <li>*Calibration (initial and continuing)</li> <li>*Blanks (method, instrument, and preparation blanks)</li> <li>*Surrogate recovery</li> <li>*Matrix spike/matrix spike duplicate (MS/MSD)</li> <li>*Field duplicates</li> <li>*Internal standard performance <ul style="list-style-type: none"> <li>Target compound identification</li> <li>Tentatively identified compounds</li> <li>System performance</li> </ul> </li> <li>*Overall assessment of data for an SDG</li> </ul>
<p><u>Non-CLP Organics and Inorganics Parameters</u></p> <ul style="list-style-type: none"> <li>*Method compliance</li> <li>*Holding times</li> <li>*Calibration (initial and continuing)</li> <li>*Blanks (method, instrument, and preparation blanks)</li> <li>*Surrogate recovery</li> <li>*Sample duplicates, MSs, MSDs, blank spikes</li> <li>*Other laboratory QC specified by the method</li> <li>*Field duplicates <ul style="list-style-type: none"> <li>Detection limits</li> <li>Compound identification</li> <li>Compound quantitation</li> <li>Sample result verification</li> </ul> </li> <li>*Overall assessment of data for an SDG</li> </ul>

## Notes:

- a "U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review." February 1994.
- b "U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review." February 1994.
- \* Items listed are evaluated by cursory review. Remaining items listed are evaluated during a full validation review.
- CLP Contract Laboratory Program
- MS Matrix Spike
- MSD Matrix Spike Duplicate
- SDG Sample Delivery Group
- QC Quality Control

TABLE 6-2

**DATA VALIDATION QUALIFIERS AND COMMENT CODES  
NAVAL AIR STATION, ALAMEDA**

<b>Data Qualifiers<sup>a</sup></b>	<b>Definition</b>
U	Compound was analyzed for, but was not detected above the concentration listed; the value listed is the sample quantitation limit.
J	Estimated concentration value; the result is considered qualitatively acceptable but quantitatively unreliable.
UJ	Estimated quantitation limit; the compound was analyzed for but was considered nondetected.
JN	An analyte has been tentatively identified; the associated numerical value represents its approximate concentration.
R	The data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.
No qualifier	The data are acceptable qualitatively and quantitatively.
<b>PRC Comment Codes</b>	<b>Definition</b>
a	Surrogate spike recovery problems
b	Blank contamination problems
c	Matrix spike recovery problems
d	Duplicate (precision) problems
e	Internal standard problems
f	Calibration problems
g	Quantification below the reporting limit
h	Other problems; refer to data validation narrative

Notes:

<sup>a</sup> "U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review." February 1994.

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**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**  
**Northern and Central California, Nevada, and Utah**  
**Contract No. N62474-94-D-7609 (CLEAN II)**  
**Contract Task Order No. 0108**

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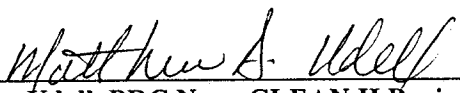
**NAVAL AIR STATION ALAMEDA**  
**ALAMEDA, CALIFORNIA**

**GROUNDWATER MONITORING PLAN**  
**VOLUME IIc: HEALTH AND SAFETY PLAN ADDENDUM**  
**FINAL**

**OCTOBER 1997**

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GROUNDWATER MONITORING PLAN  
VOLUME IIc: HEALTH AND SAFETY PLAN ADDENDUM  
FINAL

OCTOBER 1997

PLAN APPROVAL FORM

Reviewed and Approved by:

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U&A Project Manager

10/8/97  
Date

Joseph I. Sheels  
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10-8-97  
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**NAVAL AIR STATION ALAMEDA  
ALAMEDA, CALIFORNIA  
GROUNDWATER MONITORING PLAN  
VOLUME IIc: HEALTH AND SAFETY PLAN ADDENDUM  
DRAFT**

**AUGUST 1997**

**PLAN APPROVAL FORM (Subcontractors)**

Agreement to follow the requirements of this Health and Safety Plan Addendum is obtained from each subcontractor in accordance with Uribe and Associates procedures.

**Subcontractor Adoption**

I acknowledge receipt of this health and safety plan addendum and agree to follow all applicable requirements.

---

[print and sign name]

Title

Date

---

Subcontractor Representative (company)

I acknowledge receipt of this health and safety plan addendum and agree to follow all applicable requirements.

---

[print and sign name]

Title

Date

---

Subcontractor Representative (company)

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## **ATTACHMENTS**

### **Attachment**

- 1 SAFETY COMPLIANCE AGREEMENT AND DOCUMENTATION OF SITE SAFETY BRIEFING
- 2 29 CFR 1926.106 - WORKING OVER OR NEAR WATER
- 3 OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - VOLATILE ORGANICS, and METALS, PESTICIDES, PCBs, AND OTHERS
- 4 DAILY HEALTH AND SAFETY FORM
- 5 ORGANIC VAPOR DETECTOR CALIBRATION RECORD
- 6 WASTE PROFILE AND TRACKING FORMS AND COMPLETION INSTRUCTIONS
- 7 INCIDENT REPORT FORM AND INVESTIGATION COMMITTEE REPORT
- 8 WORKER'S COMPENSATION FORM

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## ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
µg/L	Micrograms per Liter
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CAL/OHSA	California Occupational Safety and Health Administration
CCR	California Code of Regulations
CEO	Corporate Executive Officer
CFR	Code of Federal Regulations
CHEMTREC	Chemical Transportation Emergency Center
CHSO	Corporate Health and Safety Officer
CLEAN	Comprehensive Long-term Environmental Action Navy
CPR	Cardiopulmonary Resuscitation
CTO	Contract Task Order
DCA	Dichloroethane
DCE	Dichloroethene
DOT	Department of Transportation
EFA West	Engineering Field Activity West
EM	Engineering Manual
EPA	U.S. Environmental Protection Agency
FPM	Field Project Manager
FSP	Field Sampling Plan
HEPA	High Efficiency Particulate Air
HSP	Health and Safety Plan
lb.	Pound
MP	Monitoring Plan
MSDS	Material Safety Data Sheets
NAS	Naval Air Station
NE	Not Expected
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PFD	Personal Flotation Devices
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	Parts per million
PRC	PRC Environmental Management, Inc.
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SCBA	Self Contained Breathing Apparatus
SHSP	Site Health and Safety Plan
SOP	Standard Operating Procedure
SSO	Site Safety Officer
TCA	Trichloroethane
TCE	Trichloroethene
U&A	Uribe and Associates
USCG	United States Coast Guard
VC	Vinyl Chloride
VOC	Volatile Organic Compound

## **1.0 INTRODUCTION**

This Health and Safety Plan (HSP) Addendum (addendum) is Volume IIc of the Groundwater Monitoring Plan for Naval Air Station (NAS) Alameda and was prepared under Comprehensive Long-term Environmental Action Navy Contract No. N62474-94-D-7609 (CLEAN II) issued by the Department of the Navy, Engineering Field Activity West (EFA West). PRC Environmental Management, Inc. (PRC) authorized Uribe & Associates (U&A) to generate a Groundwater Monitoring Plan and conduct groundwater monitoring activities, including water-level measurements, a tidal study, quarterly groundwater sampling, and other tasks at NAS Alameda under Contract Task Order (CTO) No. 0108. This addendum, together with the NAS Alameda HSP currently in use, will form the project Site Health and Safety Plan (SHSP) for the groundwater monitoring activities conducted under CTO No. 0108.

This Groundwater Monitoring Plan consists of: Volume I, a Monitoring Plan (MP) and Volume II, a Sampling and Analysis Plan (SAP). The SAP, in turn, consists of: Volume IIa, a Field Sampling Plan (FSP); Volume IIb, a Quality Assurance Project Plan (QAPP) Addendum; and Volume IIc, this addendum.

The Base-Wide HSP for the on-going investigation at NAS Alameda (PRC 1997), together with this addendum, describes specific responsibilities, requirements, and procedures, and establishes guidelines to enable field personnel to work safely during the implementation of the groundwater monitoring field activities.

### **1.1 DOCUMENT ORGANIZATION AND PURPOSE**

This addendum is written to address the specific health and safety issues identified with the groundwater monitoring activities to be conducted by U&A under CTO No. 108. The remainder of Section 1.0 provides the site's background and a discussion of health and safety plan acceptance. Section 2.0 identifies the U&A health and safety personnel and their responsibilities. Section 3.0 summarizes the groundwater monitoring tasks and the associated task-specific hazards. Sections 4.0 and 5.0 list the personnel training requirements and medical monitoring requirements, respectively. The types of personal protective equipment (PPE) and other equipment required for implementation of the groundwater monitoring tasks are summarized in Section 6.0. Work zones and decontamination

procedures are identified in Section 7.0. General site safety provisions and emergency procedures are covered in Sections 8.0 and 9.0, respectively.

Activities performed in accordance with this addendum shall also comply with the "Safety and Health Requirements" as set forth within the U.S. Army Corps of Engineers' Engineering Manual (EM) 385-1-1, dated September 1996. In addition, portions of general health and safety documents generated for work conducted under the CLEAN I and CLEAN II contracts (PRC 1993a and PRC 1995) may apply to these activities.

## **1.2 SITE BACKGROUND**

NAS Alameda is located on the east side of San Francisco Bay in Alameda, California (Figure 1-1). The station occupies the western end of the island of Alameda and was closed in May 1997. Most of the eastern end of NAS Alameda is developed with office and industrial buildings. Runways and associated support facilities occupy the western area of NAS Alameda. The groundwater monitoring tasks described in this addendum are part of the on-going remedial investigation (RI) at the facility, and are intended to collect additional groundwater data to supplement the data collected for the RI.

## **1.3 HEALTH AND SAFETY PLAN ACCEPTANCE**

Navy contractors or subcontractors performing field work are expected to read, be aware of, and follow the health and safety requirements set forth in the NAS Alameda HSP, generated in 1993, and this addendum, or the SHSP. In addition, it is a requirement of the SHSP that such personnel attend a pre-job health and safety conference to be conducted by the U&A Site Safety Officer (SSO) prior to the start of fieldwork. The purpose of the safety conference is to communicate the nature and extent of the physical and chemical hazards at the site, the required levels of protection during fieldwork, the fastest route to the hospital, emergency procedures, decontamination procedures, and key project health and safety personnel.

On-site workers will agree, in writing, to comply with the provisions of the SHSP and the requirements of the Navy CLEAN Health and Safety Program prior to beginning work. Attachment 1 contains the health and safety "Compliance Agreement and Documentation of Site Safety Briefing" to be signed by workers after reading the SHSP and after attending the safety conference. By signing the compliance

agreement, workers will be acknowledging that they have been briefed on, understand, and agree to comply with the provisions set forth in the SHSP. Signing this form will be a prerequisite to gaining access to the work site. A copy of the SHSP will be accessible to each person working on site. Copies of the agreement form will be kept in the PRC site office at NAS Alameda.

Subcontractors are expected to operate in accordance with the SHSP, or with the more stringent health and safety requirements of their employer. Any person failing to follow the procedures described in the SHSP will not be allowed access to the site during field activities.

Incorporated into this addendum, by reference, are the following U&A health and safety policy documents:

- Field Injury/Illness Prevention Program (includes Hearing Conservation and Medical Surveillance Programs) (U&A 1995a)
- Hazard Communications Program (U&A 1995b)
- Respiratory Protection Program (U&A 1995c)

In addition, incorporated herein and included in Attachment 2 is 29 Code of Federal Regulations (CFR) 1926.106, "Working Over or Near Water".

As a further requirement of the SHSP, U&A field personnel assigned to the Alameda groundwater monitoring program are expected to have a working knowledge of the policies, provisions, and requirements of these documents.

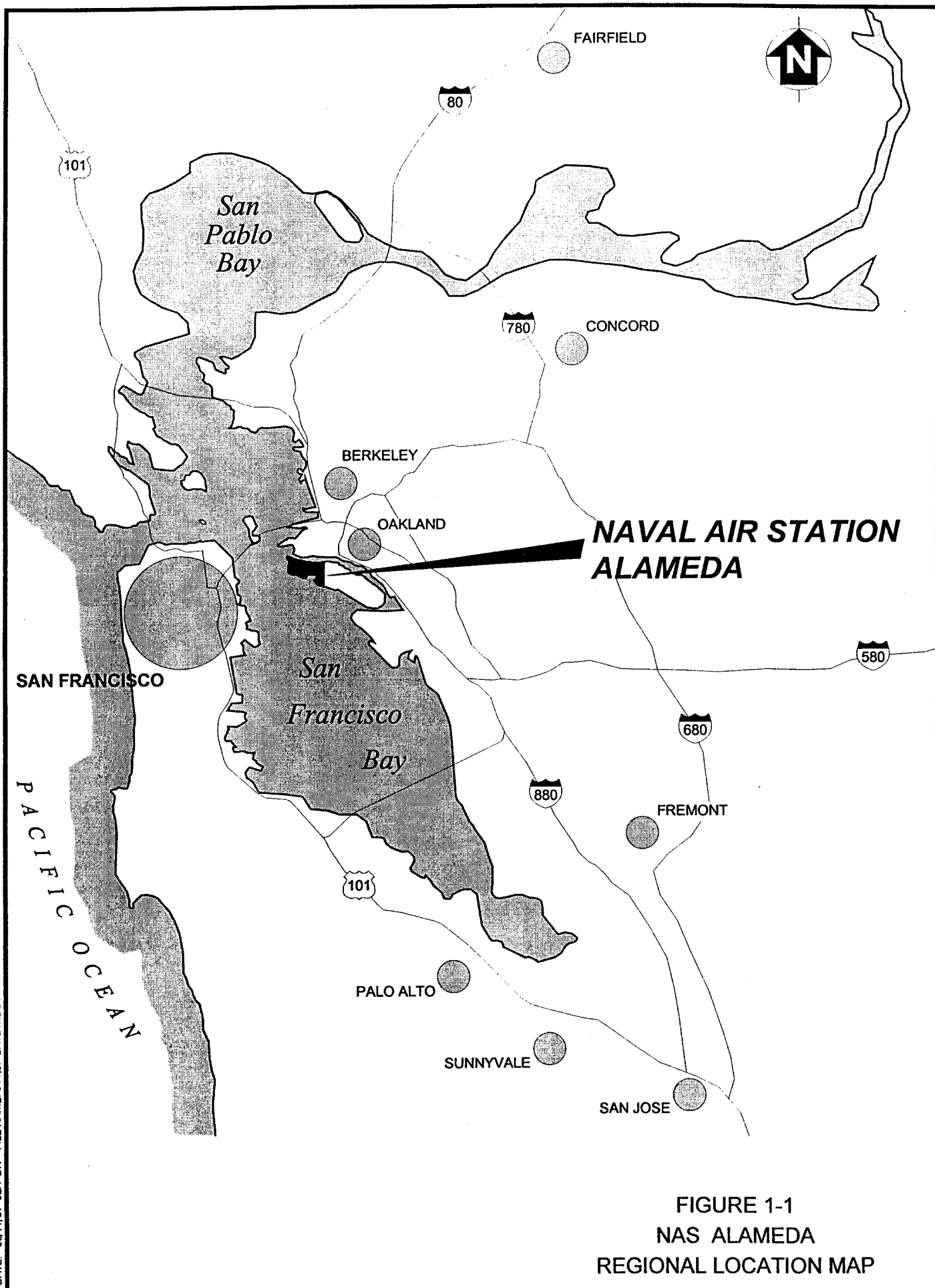


FIGURE 1-1  
NAS ALAMEDA  
REGIONAL LOCATION MAP

## **2.0 KEY PERSONNEL AND RESPONSIBILITIES**

The U&A field team will be a multi-disciplinary group including: a Field Project Manager (FPM) and SSO, geologists, engineers, environmental scientists, and technicians. Potential subcontractors include a surveyor, a well abandonment crew, and a well replacement/installation crew.

The following list designates the key U&A health and safety personnel responsible for implementing the project in accordance with the provisions of the SHSP:

- Project Manager (PM): Clare L. Gilmore
- Corporate Health and Safety Officer (CHSO): Douglas I. Sheeks, R.G.
- FPM: Brendan Mulholland
- SSO: Clare L. Gilmore

Table 2-1 summarizes the responsibilities and authorities of these individuals as they relate to health and safety.

**TABLE 2-1**  
**HEALTH AND SAFETY POSITION RESPONSIBILITIES**  
 (Page 1 of 4)

PERSON	RESPONSIBILITIES	AUTHORITIES
U&A Project Manager:  Clare L. Gilmore	<ul style="list-style-type: none"> <li>• Assure that the project is performed in a manner consistent with the Health and Safety Program</li> <li>• Assure that the project Site Health and Safety Plan is prepared, approved, and properly implemented</li> <li>• Implement the Health and Safety Plan</li> <li>• Coordinate with the CHSO and project team on health and safety matters and activities</li> </ul>	<ul style="list-style-type: none"> <li>• Assign CHSO to project and, if needed, assign a suitably qualified replacement</li> <li>• Suspend field activities if health and safety of personnel are endangered, pending an evaluation by the CHSO</li> <li>• Suspend an individual from field activities for infractions of the Health and Safety Plan, or addendum of the Health and Safety Plan pending an evaluation by the SSO and/or the CHSO</li> </ul>

**TABLE 2-1**  
**HEALTH AND SAFETY POSITION RESPONSIBILITIES**  
 (Page 2 of 4)

PERSON	RESPONSIBILITIES	AUTHORITIES
<p>U&amp;A Corporate Health and Safety Officer:</p> <p>Douglas I. Sheeks, R.G.</p>	<ul style="list-style-type: none"> <li>• Administer the Health and Safety Program</li> <li>• Track health and safety regulations that affect U&amp;A</li> <li>• Maintain records pertaining to medical surveillance, training, respirator fit testing, chemical exposure, and incidents</li> <li>• Manage the U&amp;A employee medical surveillance program</li> <li>• Audit key aspects of the Health and Safety Program and report on effectiveness to Corporate Executive Officer (CEO)</li> <li>• Provide leadership for the occupational safety and hygiene of personnel</li> <li>• Investigate reports of incidents or accidents</li> <li>• Provide employee health and safety training, particularly refresher training</li> <li>• Develop or review, approve, or disapprove project Health and Safety Plans</li> </ul>	<ul style="list-style-type: none"> <li>• Implement improvements to the U&amp;A Health and Safety Program</li> <li>• Approve the health and safety qualifications of employees</li> <li>• Approve or disapprove Health and Safety Plans</li> <li>• Establish employee training and medical surveillance procedures</li> <li>• Suspend work on any project that jeopardizes the health and safety of personnel</li> <li>• Determine the types of occupational safety and industrial hygiene services to be provided by U&amp;A</li> </ul>

**TABLE 2-1**  
**HEALTH AND SAFETY POSITION RESPONSIBILITIES**

(Page 3 of 4)

PERSON	RESPONSIBILITIES	AUTHORITIES
<p>U&amp;A Field Project Manager:</p> <p>Brendan Mulholland</p>	<ul style="list-style-type: none"> <li>• Administer the Health and Safety Program at NAS Alameda and provide recommendations for the improvement of the program</li> <li>• Maintain working understanding of key health and safety regulations and U&amp;A health and safety policies</li> <li>• Interface with U&amp;A Project Manager in matters of health and safety</li> <li>• Report to CHSO on health and safety matters</li> <li>• Conduct staff orientations on health-and safety-related activities at the site</li> <li>• Monitor compliance with the Health and Safety Plan and conduct site audits</li> <li>• Determine whether an accidental exposure or injury merits a change in the affected individual's work assignments and whether changes in work practices are required</li> <li>• Assist U&amp;A Project Manager in obtaining required health and safety equipment and coordinate project team with regard to health and safety equipment needs</li> <li>• Answer employee questions and concerns regarding health and safety</li> </ul>	<ul style="list-style-type: none"> <li>• Suspend work or otherwise limit exposure to personnel if health and safety risks are unacceptable</li> <li>• Direct personnel to change work practices if existing practices are deemed to be hazardous to the health and safety of personnel</li> <li>• Remove personnel from project if their actions or condition endangers their health and safety or the health and safety of co-workers</li> <li>• Establish employee training and medical surveillance procedures</li> <li>• Suspend work on any project that jeopardizes the health and safety of personnel</li> <li>• Determine the types of occupational safety and industrial hygiene services to be provided by U&amp;A</li> </ul>

**TABLE 2-1**  
**HEALTH AND SAFETY POSITION RESPONSIBILITIES**  
**(Page 4 of 4)**

PERSON	RESPONSIBILITIES	AUTHORITIES
U&A Site Safety Officer:  Clare L. Gilmore	<ul style="list-style-type: none"> <li>• Direct health and safety activities on site</li> <li>• Immediately report all safety-related incidents or accidents to the CHSO and FPM</li> <li>• Assist in all aspects of implementing the Health and Safety Plan</li> <li>• Confirm with emergency medical facility that emergency procedures, including access of emergency medical transport to job sites and secured areas, are defined</li> <li>• Coordinate and implement emergency procedures as required</li> <li>• Review certifications/medical surveillance status of personnel prior to site access</li> <li>• Maintain health and safety equipment on site</li> <li>• Conduct the review and acceptance of the Site Health and Safety Plan by personnel</li> <li>• Conduct and document daily health and safety briefings</li> <li>• Maintain all site-related health and safety documents and forms</li> </ul>	<ul style="list-style-type: none"> <li>• Temporarily suspend field activities if health and safety of personnel are endangered, pending further consideration by the CHSO</li> <li>• Temporarily suspend an individual from field activities for infractions of the Health and Safety Plan, pending an evaluation by the FPM and/or the CHSO</li> </ul>

**Notes:**

CEO = Corporate Executive Officer  
FPM = Field Project Manager  
SSO = Site Safety Officer

CHSO = Corporate Health and Safety Officer  
NAS = Naval Air Station  
U&A = Uribe & Associates

### **3.0 PROJECT TASKS AND ASSESSMENT OF SITE HAZARDS**

Potential site hazards associated with the field activities planned for this groundwater monitoring program include both physical and chemical hazards. Project tasks and the associated site hazards are discussed in the following sections.

#### **3.1 PROJECT TASKS**

The groundwater monitoring tasks included in this field program are:

- Installing two stilling wells to measure tidal fluctuations in San Francisco Bay
- Surveying the two stilling well locations and elevations
- Conducting water-level measurements over 24 hours in 26 locations (24 monitoring wells and two stilling wells) to establish the extent of tidal influence at the facility
- Inspecting 247 monitoring wells and piezometers installed at NAS Alameda for signs of damage and to note conditions
- Conducting facility wide water level measurements in approximately 200 monitoring wells
- Repair/replacement/re-installation of damaged monitoring wells (and re-surveying, if necessary)
- Water supply well abandonment
- Groundwater sampling in approximately 100 wells

These activities will be conducted in accordance with the PRC Standard Operating Procedure (SOP) for groundwater sampling (SOP 010). A copy of this SOP is included in Appendix A of the FSP (Volume IIa of this Groundwater Monitoring Plan).

#### **3.2 ASSESSMENT OF TASK-SPECIFIC HAZARDS**

The tasks that will be performed during the planned fieldwork at NAS Alameda have been classified as non-intrusive activities, low hazard activities, or moderate hazard activities. These activities have, in turn, been classified as having either a “substantial physical or other safety hazard” or a “chemical

contamination or other health hazard” in Table 3-1. None of the proposed tasks are rated as high-hazard activities. The task-specific hazard classification for each job task to be performed is summarized in Table 3-1.

The identified physical and chemical hazards associated with one or more of these groundwater monitoring tasks include:

- exposure to volatile organic compounds (VOC) and benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds through inhalation or dermal contact with contaminated groundwater
- slipping, tripping, and falling on potentially wet surfaces or unseen obstacles
- injuries associated with manual lifting of equipment and/or supplies
- injuries associated with vehicles and heavy equipment (drilling rigs)
- injuries associated with steam cleaning equipment
- long-term hearing loss associated with excessive noise
- heat or cold stress
- cold stress or drowning hazards associated with working near bodies of water
- insect bites or stings and/or spider bites (spiders are frequently located inside outer well casings)
- rabies or plague associated with vermin bites
- hantavirus pulmonary syndrome associated with vermin habitats
- effects of poisonous or harmful plants

The following sections discuss these hazards in greater detail, including recommended controls for each hazard. Table 3-2 provides a job hazard analysis summary listing potential job hazards for each principal step of each task and specifies the sites where the tasks will be performed.

### **3.2.1 Exposure to Contaminated Media Through Inhalation or Dermal Contact**

Two tables (one for volatile organics, and one for metals, pesticides, polychlorinated biphenyl [PCB]s, and others) from the PRC HSP (included as Attachment 3 of this addendum) supply the exposure guidelines for the potential contaminants at NAS Alameda.

The SSO will be responsible for ensuring that proper controls, such as the use of PPE, are available and implemented during the proposed tasks to reduce the possibility of workers being exposed to potentially contaminated media, including contaminated water, organic vapors, or dust. Gloves shall be worn by workers at all times during the planned groundwater sampling and water-level measuring activities. Section 6.0, Personal Protective Equipment, provides additional information on recommended controls.

### **3.2.2 Slipping, Tripping, Falling**

Work zone surfaces shall be maintained in a neat and orderly state to minimize the possibility of slips, trips, or falls which could potentially cause cuts and bruises. Equipment shall not be stored on the ground on foot traffic routes. Tools and materials shall not be left randomly on surfaces where they are not in direct use. Special caution, including adequate lighting, will be used during nighttime water-level measurements.

### **3.2.3 Manual Lifting Techniques**

For any tasks involving manual material or equipment handling, personnel shall use safe lifting techniques. When heavy objects must be lifted manually, workers shall keep the load close to the body and avoid any twisting or turning motions to minimize stress on the lower back. An adequate number of personnel or an appropriate mechanical device must be used to safely lift or handle heavy equipment.

### **3.2.4 Vehicles and Heavy Equipment**

Vehicles shall be operated only in authorized areas by properly trained and licensed personnel. When moving equipment, personnel should exercise caution so as not to damage equipment or cause injury. Drill rigs may never be moved with the drill mast (or boom) in the upright position. When backing up heavy vehicles (larger than pickup trucks), passenger vehicles, or pickups with obscured rear vision, a

person shall stand outside of the vehicle and safely direct the operator of the vehicle. Heavy vehicles and equipment shall be equipped with a minimum of one fire extinguisher for each unit.

Only qualified subcontractor personnel shall operate drilling equipment during field activities. Subcontractors shall maintain operable safety devices (such as backup alarms, emergency stops, and guards) on machinery and rotating or vibrating equipment at all times. Subcontractors shall implement effective safety programs for equipment use. Heavy equipment with rotating or vibrating shafts or gears shall be guarded to prevent accidental contact. In cases where rotating or vibrating parts cannot be adequately guarded, only experienced operators shall be allowed to work around these parts. Personnel who must work around rotating or vibrating equipment shall not wear loose fitting clothes that could get caught in the equipment. Special precautions should be observed during drilling operations involving casing removal to avoid potential accidents caused by equipment failure or breakage.

#### **3.2.5 Steam Cleaning Equipment**

Steam cleaner operators shall use eye and face splash protection. Only qualified personnel trained in the safe operation and maintenance of such equipment shall be authorized to use the steam cleaner. Subcontractors operating such equipment shall include safety precautions in their code of safe practices.

#### **3.2.6 Noise**

Working near a drilling rig can subject workers to noise exposures in excess of allowable limits. Personnel who do not need to be next to loud equipment should stay as far away as possible to lower the risk of noise-induced hearing loss. Personnel who operate or must work next to the drill rig shall be required to wear hearing protection (ear plugs or muffs) to reduce their exposure to excessive noise. The use of ear plugs or ear muffs is mandatory when noise prevents conversation in a normal voice at a distance of 3 feet. This "rule of thumb" is an indication that noise levels may exceed the Occupational Safety and Health Administration (OSHA) action level of 85 decibels. All personnel required to wear hearing protection as outlined in this section shall be in a hearing conservation program in compliance with 29 CFR Section 1910.95 and 8 California Code of Regulations (CCR) Section 5096. Methods used to comply with OSHA hearing conservation requirements are set forth in the U&A Field Injury/Illness Prevention Program

Subcontractor personnel shall implement equivalent effective hearing conservation programs in accordance with program requirements.

### **3.2.7 Heat or Cold Stress**

Due to the expected temperature (60 - 65 degrees Fahrenheit [°F]) for these field activities, heat stress is not expected to become a significant risk factor. However, personnel should be aware of the symptoms of heat stress so that treatment can be provided immediately should it occur. The SSO shall initiate a heat stress monitoring program whenever personnel are wearing semi-permeable or impermeable protective clothing and the outside temperature reaches 70°F. For personnel in normal work clothing, a heat stress monitoring program shall be initiated when the outside temperature exceeds 80°F.

Heat stress monitoring shall consist of taking heart-rate measurements by radial pulse for 30 seconds at the beginning of a rest period. The initial work/rest interval will be determined by the SSO based on the ambient temperature, level of PPE worn, and other site factors. At temperatures of 70 °F, or greater, when workers are in semi-permeable or impermeable protective clothing, an initial rest period of 15 minutes should be called after no more than one hour of work. A worker's heart rate should not exceed 110 beats per minute. If the heart rate is higher, the next work period will be shortened by a third while the length of the rest period remains the same. If the heart rate still exceeds 110 beats per minute at the next rest cycle, the following work period will be shortened by a total of two thirds. In extremely hot weather (90 °F and above), alternatives such as working at night or using specialized clothing and equipment (ice vests or other cooling devices) will be considered.

Since some of the proposed work will take place near water or be performed at night, cold stress may become a risk factor, particularly when ambient temperatures are low and field personnel are exposed to moisture or are not adequately clothed. Personnel should be aware of the symptoms of cold stress so that treatment can be provided immediately should cold stress occur. The SSO shall initiate a cold stress monitoring program whenever the outside temperature falls below 50°F and workers are dry, or 60°F whenever workers are exposed to moisture or become wet.

Cold stress monitoring shall consist of observing workers, at rest or at work, for symptoms of cold stress, including numbing of extremities, shivering, apathy, listlessness, sleepiness, or unconsciousness. The

potential for wind chill shall also be considered. The SSO shall ensure that all workers potentially exposed to lower temperatures are properly clothed.

### **3.2.8 Working Near Bodies of Water**

Due to the proposed stilling well installation adjacent to the Oakland Inner Harbor and the Seaplane Lagoon, which requires workers to be near water, the SSO shall provide for United States Coast Guard (USCG)-approved life jackets or buoyant work vests (personal flotation devices, or PFD) and a ring buoy (in case somebody falls into the water) to workers who shall be engaged in such work in accordance with 29 CFR 1926.106 (Attachment 2). Launching and positioning a lifesaving skiff at each of the two stilling well locations for emergency rescue will cause more additional hazards than can be justified. Therefore, the buddy-system and self-rescue will be relied upon if workers should fall into the water. The work crew will be responsible for conducting the work in the safest manner possible and for effecting their own rescue in the event of an emergency. If needed, rescue shall be attempted by use of a ring buoy or by tossing a line to the person who is in the water. The person should then be towed to the nearest shore or dock. Upon reaching shore, precautions against cold stress shall be implemented as described in the previous section. In addition, dry clothing, blankets and/or towels will be available nearby in the event of a worker falling into the water.

### **3.2.9 Insects**

Bees, wasps, yellow jackets, scorpions, and black widow and brown recluse spiders present a potential hazard during the Alameda groundwater monitoring tasks, especially for those individuals sensitive to those bites or stings. Prior to initial assignment on the projects, personnel with known allergic responses to insect stings shall make their field supervisors aware of this condition. These personnel shall also carry an antidote kit if so advised by their physician. The SSO shall confirm that the antidote kit is accessible and notify the emergency medical service providers in the event of any incident.

In all cases, a victim suspected of being bitten by a black widow spider or brown recluse spider, or stung by a scorpion, shall receive medical attention. The venom from the brown recluse spider is capable of causing coma and kidney failure in its victim.

Protection against insects, such as protective clothing, repellents, extermination, and training in recognition and identification of harmful insects, may be employed.

### **3.2.10 Vermin**

Vermin (rats, mice, squirrels, and rabbits) are possible in the proposed work areas. These animals may be carriers of such diseases as rabies, plague, or hantavirus. Whenever such animals or their droppings are observed in or near the proposed work areas, the SSO shall be notified immediately. The SSO shall immediately notify the U&A CHSO for further guidance, possibly including suspending field activities until such time as it is deemed safe to resume them. The SSO will be responsible for ensuring that proper controls, such as the use of PPE and personal hygiene practices, are available and implemented during the proposed work to reduce the possibility of workers being exposed to such animals and coming into contact with media potentially contaminated by them. Care shall be taken to avoid vermin nesting places or vegetation or debris that may be used as hiding places. To avoid causing hantavirus from becoming airborne, kicking up dust in these areas should be avoided. If dusty conditions become a factor, respirators with High Efficiency Particulate Air (HEPA) filters shall be worn until such time as the condition ceases.

### **3.2.11 Harmful Plants**

Poison oak presents a potential hazard during the groundwater monitoring tasks, especially for those individuals sensitive to this plant. Protection against plants, such as protective clothing, and training in the recognition and identification of harmful plants, may be employed.

**TABLE 3-1**  
**TASK-SPECIFIC HAZARD CLASSIFICATION**

Category/Main Task	Substantial Physical or Other Safety Hazard	Chemical Contamination or Other Health Hazard
<b>Non-intrusive Activity</b>		
Stilling well installation	x	--
Surveying	--	--
Monitoring well inspection	--	--
<b>Low Hazard Activity</b>		
...24-Hour tidal study	--	x
...Facility-wide water level measurement	--	x
...Monitoring well repair	--	x
<b>Moderate Hazard Activity</b>		
...Well replacement/re-installation	x	x
...Well abandonment	x	
...Quarterly groundwater sampling	--	x

**TABLE 3-2**  
**JOB HAZARD ANALYSIS SUMMARY**  
**(Page 1 of 4)**

<b>Task</b>	<b>Principal Step</b>	<b>Site</b>	<b>Safety Hazards</b>	<b>Chemical Hazards</b>	<b>Physical Hazards</b>	<b>Biological Hazards</b>
Stilling Well Installation	Staging	Seaplane Lagoon (Site 17) and Oakland Inner Harbor (Site 20)	Slips, trips, falls, drowning	NE	Heat/cold stress; water safety hazard	Poisonous or harmful plants, animals, or insects
Stilling Well Installation	Well installation	Seaplane Lagoon (Site 17) and Oakland Inner Harbor (Site 20)	Slips, trips, falls, drowning	NE	Heat/cold stress; water safety hazard	Poisonous or harmful plants, animals, or insects
Surveying	Surveying	Sites 17 and 20 and potentially any other site	Slips, trips, falls, drowning	NE	Heat/cold stress; water safety hazard	Poisonous or harmful plants, animals, or insects
Tidal Study	Locating and opening wells	Sites 2, 3, 4, 5, 9, 10A, 11, 16, 17, and the housing area	Slips, trips, falls; equipment (well covers)	Potential air or water contamination at Site 2 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Tidal Study	Measuring water levels	Sites 2, 3, 4, 5, 9, 10A, 11, 16, 17, and the housing area	Slips, trips, falls; darkness	Potential air or water contamination at Site 2 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Tidal Study	Decontamination	Sites 2, 3, 4, 5, 9, 10A, 11, 16, 17, and the housing area	Slips, trips, falls; darkness	Potential water contamination at Site 2 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Tidal Study	Closing wells	Sites 2, 3, 4, 5, 9, 10A, 11, 16, 17, and the housing area	Slips, trips, falls; equipment (well covers)	Potential air or water contamination at Site 2 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects

**TABLE 3-2**  
**JOB HAZARD ANALYSIS SUMMARY**  
**(Page 2 of 4)**

<b>Task</b>	<b>Principal Step</b>	<b>Site</b>	<b>Safety Hazards</b>	<b>Chemical Hazards</b>	<b>Physical Hazards</b>	<b>Biological Hazards</b>
Well Inspection	Locating and inspecting well exteriors (concrete, cover/lid, gasket, bolts)	All sites/areas	Slips, trips, falls	NE	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Well Inspection	Opening and inspecting well interiors (caps, locks, grout seal)	All sites/areas	Slips, trips, falls; equipment (well covers)	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Well Inspection	Closing wells	All sites/areas	Slips, trips, falls; equipment (well covers)	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Water Level Measurement	Opening wells	Sites 2, 3, 4, 5, 9, 10A, 11, 16, 17, and the housing and runway areas	Slips, trips, falls; equipment (well covers)	Potential air or water contamination at Site 2 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Water Level Measurement	Measuring water levels	Sites 2, 3, 4, 5, 9, 10A, 11, 16, 17, and the housing and runway areas	Slips, trips, falls	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Water Level Measurement	Decontamination	Sites 2, 3, 4, 5, 9, 10A, 11, 16, 17, and the housing and runway areas	Slips, trips, falls	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects

**TABLE 3-2**  
**JOB HAZARD ANALYSIS SUMMARY**  
 (Page 3 of 4)

Task	Principal Step	Site	Safety Hazards	Chemical Hazards	Physical Hazards	Biological Hazards
Water Level Measurement	Closing wells	Sites 2, 3, 4, 5, 9, 10A, 11, 16, 17, and the housing and runway areas	Slips, trips, falls; equipment (well covers)	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Well Repair	Repairing grout seal, and/or repairing/replacing lids, caps, or locks	Unknown at this time (potentially any site)	Slips, trips, falls; heavy equipment	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress; heavy equipment; lifting; cuts/bruises	Poisonous or harmful plants, animals, or insects
Well Replacement	Re-drilling/re-installing wells and abandoning wells (if previously destroyed)	Unknown at this time (potentially any site)	Slips, trips, falls; heavy equipment (drilling rig)	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress; heavy equipment; lifting; cuts/bruises; dust; noise/vibration	Poisonous or harmful plants, animals, or insects
Well Replacement	Decontamination	Unknown at this time (potentially any site)	Slips, trips, falls; heavy equipment (steam cleaning equipment)	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress; heavy equipment; lifting; cuts/bruises	Poisonous or harmful plants, animals, or insects
Pan Am Well Abandonment	Staging	Pan Am well location	Slips, trips, falls; heavy equipment	NE	Heat/cold stress; heavy equipment; lifting	Poisonous or harmful plants, animals, or insects
Pan Am Well Abandonment	Pump removal	Pan Am well location	Slips, trips, falls; heavy equipment; lifting	NE	Heat/cold stress; heavy equipment; lifting; cuts/bruises	Poisonous or harmful plants, animals, or insects

**TABLE 3-2**  
**JOB HAZARD ANALYSIS SUMMARY**  
**(Page 4 of 4)**

<b>Task</b>	<b>Principal Step</b>	<b>Site</b>	<b>Safety Hazards</b>	<b>Chemical Hazards</b>	<b>Physical Hazards</b>	<b>Biological Hazards</b>
Pan Am Well Abandonment	Video logging	Pan Am well location	Slips, trips, falls	NE	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Pan Am Well Abandonment	Pouring grout	Pan Am well location	Slips, trips, falls; heavy equipment; lifting	NE	Heat/cold stress; heavy equipment; lifting; dust; cuts/bruises; noise/vibration	Poisonous or harmful plants, animals, or insects
Groundwater Sampling	Staging	All sites	Slips, trips, falls	NE	Heat/cold stress	Poisonous or harmful plants, animals, or insects
Groundwater Sampling	Sample collection and packing	All sites	Slips, trips, falls; equipment (well covers)	Potential air or water contamination at Sites 1, 2, 4, 5, 7A, 7C, and 13 (see Table 5)	Heat/cold stress	Poisonous or harmful plants, animals, or insects

Note:

NE = Not Expected

## **4.0 TRAINING REQUIREMENTS**

The training requirements for personnel involved with groundwater monitoring field activities at NAS Alameda are provided in the following sections.

### **4.1 SAFETY TRAINING**

All personnel involved with field activities shall have completed a 40-hour health and safety training course or be trained in accordance with the hazardous waste training requirements specified in 29 CFR 1910.120 (8 CCR 5192). Personnel directly supervising employees in the exclusion or contamination reduction zone (see Section 7.0 for a description of the work zones) shall have received the 8-hour supervisory training for hazardous waste operations. All personnel shall be current with respect to the 8-hour refresher requirements of 29 CFR 1910.120 (8 CCR 5192).

In accordance with regulatory requirements, employees without documentation of supervised field experience shall work under close supervision until they complete 24 hours of supervised field experience. This experience shall be documented in writing by the employer upon completion.

In addition, on-site workers must participate in a medical surveillance program, in accordance with 29 CFR 1910.120 (f) as discussed in Section 5.0, below. Certification by an occupational physician of the worker's physical fitness and the ability to perform the assigned fieldwork are required. The physician's certification shall include a statement of qualification for use of respiratory protection equipment.

A file containing copies of the documentation of medical surveillance and other required training for all site workers will be created before workers begin fieldwork and will be kept on site by the SSO.

Required documents for each individual working in the field are listed below:

- Physician's statement for hazardous waste site work
- Physician's statement for respirator use, if such use is contemplated
- Respirator fit-test certificate (for each model and size that may be required)
- Respirator training certificate for special devices, as required
- Documentation of 3 days supervised field experience on a hazardous waste site

- Training course certificate, 40 (or 24) hours
- Refresher training course certificate (if greater than 1 year has elapsed since initial training)
- Supervisor training certificate (8-hour), as applicable
- First aid/Cardiopulmonary Resuscitation (CPR) training certification, if required based upon site-specific needs
- Employer's certification that the employee has completed training to a level required by job function and responsibilities

The SSO and all other on-site personnel must hold a valid certificate in first aid and CPR training from the American Red Cross, or an equivalent agency.

#### **4.1.1 Subcontractor Requirements**

It is anticipated that the following tasks will require a subcontractor in addition to the U&A field staff:

- Surveying of the two stilling well locations and elevations
- Repair/replacement/re-installation of damaged monitoring wells
- Re-surveying of repaired monitoring wells, if necessary
- Pan Am water supply well abandonment

Each subcontractor is responsible for maintaining an independent health and safety program for its employees. Subcontractor employees shall show proof of qualification and completion of all required training and medical surveillance dates, and maintain copies of all required records and documentation on site.

The subcontractor representative shall submit the following information in advance of site work:

- Designation of a competent person to perform drilling and other activities, as required
- Designation of a health and safety coordinator and alternate health and safety coordinator for each task
- Designation of a company health and safety official or manager

- Copies of the subcontractor's health and safety plan for general field operations, any site-specific interface documents deemed necessary for the site, and SOPs
- Copies of the subcontractor's health and safety program, injury and illness prevention program, and code of safe work practices, as applicable
- Copy of the subcontractor's respiratory protection program, medical surveillance program, employee exposure records maintenance program, hazard communication program, emergency plans, and any other OSHA-required program documents applicable to the work scope
- Material Safety Data Sheets (MSDS) and product names index for all products brought on site
- Written agreement to follow applicable SHSP requirements

In addition, the subcontractor shall maintain the following on site:

- Documentation of inspection and certification of safe operating condition by a competent person for each item of on-site machinery or mechanized equipment
- Manufacturer's instructions or company operating procedures for each on-site item of machinery or mechanized equipment

#### **4.2 DAILY SAFETY BRIEFINGS**

In addition to the initial health and safety conference conducted prior to field activities, daily site-specific safety briefings will be conducted by the SSO at the beginning of each work day, prior to commencement of work, for the purpose of discussing current operations, communicating specific site hazards, reviewing site safety procedures, and providing updated information based on observed field conditions.

All on-site personnel will be required to attend the briefing. Personnel who arrive on site after work has already commenced will be given this briefing prior to entering any exclusion zone. These briefings will be documented by the SSO in the field logbook and on the Daily Health and Safety Form (see Attachment 4).

### **4.3**

### **DISTRIBUTION OF SITE HEALTH AND SAFETY PLAN**

Before site work begins, access to a copy of the SHSP will be provided to personnel assigned to work at the site, as well as to an authorized representative of each firm subcontracted to perform work on site. The SSO is responsible for ensuring that a copy of the SHSP is available on site whenever work is in progress.

## **5.0 MEDICAL MONITORING**

Any person present on site during work activities who may be exposed to health hazards related to site operations shall be required to undergo medical monitoring, including a documented yearly occupational health assessment examination. A physician's statement or other acceptable documentation stating that the worker is physically qualified to work with hazardous materials is required for each worker. If respiratory protection is required, each user shall be qualified by a physician's statement which includes a physician's respirator-use certification and an annual fit test.

Site personnel shall be required to participate in their employer's OSHA-compliant (29 CFR 1910.120) medical surveillance and hearing conservation programs before being permitted to work on program field sites. The U&A Field Injury/Illness Prevention Program includes the Medical Surveillance Program for U&A employees.

Subcontractors shall be required to demonstrate, by submittal of program documents, a functioning OSHA-compliant medical surveillance program. Subcontractor medical surveillance records are maintained by the subcontractor. Subcontractors shall certify in writing that personnel are medically qualified in accordance with OSHA standards. Subcontractors shall maintain on-site proof of medical qualification expiration dates, work limitations, and respirator use approval. This shall be in the form of copies of records or a records summary.

Exceptions to the medical surveillance requirements may be allowed for specialty subcontractors performing nonintrusive or otherwise non-hazardous activities. Specific exceptions shall be made on a case by case basis.

## 6.0 PERSONAL PROTECTIVE EQUIPMENT

PPE will be worn during field activities and will be provided by each employer for its employees. The initial level of PPE that will be required to implement the field activities is modified Level D - absent a determination of no hazard or no significant risk. The specifications for the levels of PPE that will be worn, or that may be required based on exceeding action levels, are shown in Table 6-1. Modification of the initial PPE level may be required if site conditions warrant, or if air monitoring shows concentrations of organic vapors are present. The initial PPE level may be modified by the SSO with approval by the CHSO based on additional site information or monitoring conducted during work.

Groundwater samples have been previously collected and analyzed from all installed wells that will be measured or sampled during the groundwater monitoring tasks at NAS Alameda. Since the groundwater has been adequately characterized, air monitoring will not be conducted at wells where low levels of VOCs were detected or where VOCs were not detected. Breathing zone air monitoring will be required for sampling or measuring water levels in the 17 wells where concentrations of VOCs detected in groundwater are of concern. If photoionization detector (PID) readings exceed 1 part per million (ppm) in the breathing zone in the vicinity of these wells, respiratory protection will be donned and air monitoring will continue. Attachment 5 includes an instrument calibration record form for the organic vapor detector. Section 2.1 of SOP No. 10 (Groundwater Sampling), included in Appendix A of the FSP, (Volume Iia of this Groundwater Monitoring Plan) specifies the procedure for approaching monitoring wells, including approaching from the upwind side. Table 6-2 summarizes the 17 wells with high VOC concentrations detected in the groundwater, and the compounds detected in each.

Benzene and vinyl chloride (VC) will be used as the governing compounds for upgrading to Level C PPE due to their low OSHA exposure limits.

Special caution will be taken when sampling the five monitoring wells with VC previously detected in groundwater samples. VC results from the decomposition of chlorinated materials such as plastics and solvents and is a recognized human carcinogen. The OSHA standard for VC establishes an exposure limit of 1 ppm as a time-weighted average and 5 ppm as a short-term exposure limit (15 minutes). Where measured concentrations may exceed 10 ppm, only a Type C airline or self contained breathing apparatus (SCBA) unit may be used for respiratory protection. For the groundwater monitoring tasks at NAS Alameda, PID readings in excess of 10 ppm in the breathing zone near wells where VC has been detected

in groundwater will be cause for task shutdown and notification of the CHSO and the SSO. If negative pressure air filtering respirators are used in the vicinity of wells where VC was detected and volatiles are measured in the breathing zone, the air filter cartridges shall be replaced daily.

**TABLE 6-1**  
**PPE LEVELS**

<b>U.S. EPA PPE Level</b>	<b>Required PPE</b>
<b>Level D</b>	<ul style="list-style-type: none"> <li>- Disposable coveralls, cotton coveralls, or work clothes</li> <li>- Safety glasses with side shields</li> <li>- Steel-toed shoes (rubber steel-toed boots when work in water is a possibility)</li> <li>- Hard hat</li> <li>- Ear protection (in high noise areas)</li> </ul>
<b>Modified Level D</b>	<ul style="list-style-type: none"> <li>- Water-resistant Tyvek (or equivalent) coveralls (where contact with contaminated water or wet soils - absent a determination of background or no significant risk - is likely)</li> <li>- Plain Tyvek (or equivalent) coveralls (where contact with dry soils contaminated with minimal quantities of petroleum products is likely)</li> <li>- Nitrile gloves</li> <li>- Safety glasses with side shields</li> <li>- Steel-toed shoes (rubber steel-toed boots when work in water is a possibility)</li> <li>- Hard hat</li> <li>- Ear protection (in high noise areas)</li> </ul>
<b>Level C</b>	<ul style="list-style-type: none"> <li>- Water-resistant Tyvek (or equivalent) coveralls (where contact with contaminated water or wet soils - absent a determination of background or no significant risk - is likely)</li> <li>- Plain Tyvek (or equivalent) coveralls (where contact with dry soils contaminated with minimal quantities of petroleum products is likely)</li> <li>- Safety glasses with side shields</li> <li>- Inner Nitrile gloves</li> <li>- Outer Nitrile gloves</li> <li>- Steel-toed shoes</li> <li>- Hard hat</li> <li>- Full-face respirator, or half-face respirator and safety glasses with side shield, with combination High Efficiency Particulate Air (HEPA) filters, and acid, gas, and organic vapor cartridges (upgrade from Level B if volatiles detected in the breathing zone at 1 ppm)</li> <li>- Ear protection (in high noise areas)</li> </ul>

Notes:

U.S. EPA = U.S. Environmental Protection Agency  
PPE = Personal protective equipment

**TABLE 6-2**  
**VOC CONCENTRATIONS IN SELECTED WELLS**

Site	Well	Compound(s) Detected	Range of Detected Concentrations (in µg/L)
Site 1	M-028A	vinyl chloride (VC), trichloroethene (TCE), dichloroethene (DCE), and dichloroethane (DCA)	1,000 to 10,000
Site 1	M-101A	VC, DCE, DCA	500 - 1,000
Site 2	M-024A	chlorobenzene	100 - 500
Site 2	M-024E	chlorobenzene	100 - 500
Site 4	MW360-1	TCE	1,000 - 5,000
Site 4	MW360-2	DCE, DCA, trichloroethane (TCA), TCE	100 - 1,000
Site 4	MW360-4	VC, DCE, TCE	100 - 2,100
Site 5	MW05-05	DCE, DCA, VC	100 - 500
Site 5	MW05-04	TCA, DCA, DCE, TCE, VC	100 - 1,000
Site 5	MW05-03	benzene, toluene, ethylbenzene, and/or xylene compounds (collectively known as BTEX)	100 - 500
Site 7A	W-2	BTEX	100 - 500
Site 7A	W-1	BTEX	100 - 1,000
Site 7A	W-3	BTEX	100 - 5,000
Site 7C	MW547-3	BTEX	100 - 1,000
Site 7C	MW547-4	BTEX	500 - 1,600
Site 7C	MW547-5	BTEX	500 - 2,000
Site 13	MW-1	BTEX	100 - 500

Note:

µg/L = Micrograms per liter

## **7.0 WORK ZONES AND DECONTAMINATION PROCEDURES**

Monitoring well re-installation and well abandonment are the only anticipated activities which may require the establishment of work zones and decontamination procedures, based on possible contamination. The remaining activities will not require the use of work zones. A description of such zones and procedures follows. In accordance with OSHA regulations, three work zones will be established as noted below.

- The Exclusion Zone is an area where contamination could or does occur. The Exclusion Zone will be clearly marked with flagging or traffic cones that enclose an area to be determined before the field activity begins. The SSO will establish the limit of the Exclusion Zone. No one will be allowed to enter the Exclusion Zone unless they are wearing the appropriate level of PPE as designated by the SSO.
- The Contamination Reduction Zone is located immediately outside the Exclusion Zone. This zone is designed to limit the migration of contaminants from potentially contaminated areas to uncontaminated areas. Personnel and equipment decontamination occurs in this area.
- The Support Zone is located outside the Contamination Reduction Zone. This zone is an uncontaminated area. Supporting equipment and facilities will be located in this area. Site visitors who do not have 40-hour OSHA Health and Safety training will not be allowed past the Support Zone.

Site control is important to protect the safety and health of all personnel. While site control is primarily the responsibility of the FPM, it requires a combined effort from all personnel to control unauthorized access to the work site. Work zones will be designated at the site safety meetings held at the beginning of each work day, or more often if necessary to accommodate changing field conditions.

### **7.1 PERSONNEL DECONTAMINATION**

Personnel exiting the Exclusion Zone will be decontaminated before leaving the Contamination Reduction Zone. Primary decontamination will be done at the border of the Exclusion and Contamination Reduction Zones.

Decontamination for Level D PPE will include rinsing boots with phosphate-free soap and water and removing coveralls or work clothes. Disposable coveralls, gloves, or outer boot coverings, if worn, will be discarded appropriately. If cotton coveralls or work clothes are worn, they will be removed prior to

leaving the site and street clothes will be donned. Personnel are advised to shower as soon as possible after leaving the site.

Decontamination for Modified Level D and Level C PPE will be as follows:

- Wash boots or boot covers and outer gloves with a long-handled brush in a wash tub containing a phosphate-free cleaning detergent (such asalconox) and water.
- Rinse boots or boot covers and outer gloves with water using a long-handled brush in a wash tub containing potable water or by using a sprayer if available.
- Remove tape used to seal the gloves and boot covers and place in appropriate PPE container.
- Remove Tyvek and place in appropriate PPE container.
- Remove boot covers and place in appropriate PPE container.
- Remove outer gloves and place in appropriate PPE container.
- Boots will be inspected and checked for further decontamination, as needed.
- Remove respirators or face masks and place them on an equipment table for decontamination.
- Place inner gloves (Level C) in appropriate PPE container.
- Personnel are advised to shower as soon as possible after leaving the site.

NOTE: The water-repellency of non-coated Tyvek and similar garments is due to the surface tension of water and the resistance of the Tyvek fiber to wetting. The presence of surfactants, such as detergents, in the water defeats the water-repellent properties of Tyvek. Therefore, non-coated Tyvek and similar fabrics should never be exposed to detergent and water solutions during the decontamination process.

## **7.2 EQUIPMENT DECONTAMINATION**

Decontamination is the process of washing outer surfaces of sampling equipment or removing disposable equipment in order to minimize the potential for cross-contamination of samples or migration of contaminants off site.

Bailing of groundwater to collect samples will be conducted using disposable bailers for each monitoring well so that sampling equipment will not require decontamination.

The decontamination procedures for water-level measuring equipment are as follows:

- Water-level measurement tools are cleaned with a deionized water rinse and wiped dry with paper towels after each use.
- Rinsate water will not be collected.

For potential drilling activities associated with well repair and/or re-installation, equipment decontamination will involve steam cleaning drilling augers and any other equipment that comes in contact with potentially contaminated media.

### **7.3 DISPOSAL OF PPE AND DECONTAMINATION MATERIALS**

Disposable protective clothing and supplies not contaminated by a potentially hazardous substance will be placed in plastic trash bags and discarded in trash bins at NAS Alameda. All protective clothing and supplies that may be contaminated by potentially hazardous substances will be placed in appropriate PPE containers. Rinsate and detergent solutions generated during decontamination of potentially contaminated field equipment will be collected and containerized. Liquids may be placed in Department of Transportation (DOT)-approved 55-gallon, labeled drums and transferred to the IDW storage tank in the staging area. Other materials should be drummed and transferred to the staging area at the far western area of NAS Alameda. Drum labels will include site location where collected, date collected, worker's initials, project name, project number, and contents. A waste container tracking form will be completed once the drum is filled. Proper disposal will be based on the analytical results of confirmation samples. Attachment 6 includes samples of a drum label, a derived waste disposition form, an investigation derived waste profile form, and instructions for completing the investigation derived waste form.

## **8.0 GENERAL SITE SAFETY PROVISIONS**

Specific requirements that personnel must meet as a condition of site access include the following:

- Personnel shall fully comply with the requirements set forth in this HSP and applicable documents referenced herein.
- Personnel shall report to work ready for work and free from the influence of alcohol, illegal or controlled substances, or prescription or non-prescription pharmaceuticals that may affect their ability to work safely.
- Personnel shall report to work with safety gear required for anticipated tasks. Hard hats, safety glasses, boots, or gloves will not be provided or loaned to subcontractor personnel.
- Personnel are required to report all injuries and incidents to the SSO, even if considered minor.
- Personnel shall follow the direction of the SSO on safety or health matters, stop-work orders, or emergency evacuations.
- Personnel shall sign an acknowledgment of training received (Attachment 1) and an agreement to follow the requirements of this HSP.
- Personnel are expected to obey existing medical or work restrictions and to inform the SSO or their employer's safety or medical officer of any potentially relevant medical conditions that may affect their safety or the safety of others.
- Personnel are expected to maintain a high level of safety awareness.
- Personnel are expected to identify unsafe conditions, damaged or inadequate PPE, and other conditions or events that they believe are potentially hazardous.
- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material shall be prohibited in any area where the possibility of contamination exists.
- Face and hands must be thoroughly washed upon leaving a contaminated or suspected contaminated area before eating, drinking, or any other related activities transpire.
- Legible and understandable precautionary labels shall be prominently affixed to containers of scrap, waste, debris, and contaminated clothing.
- Contaminated protective clothing shall not be removed from the Contamination Reduction Zone until it has been cleaned or properly packaged and labeled.

- Excessive facial hair, which interferes with a satisfactory fit of the respirator mask-to-face seal, shall not be permitted.
- Contact with potentially contaminated substances should be avoided. Personnel should not walk through puddles, pools, or mud; kneel on the ground; lean or sit on equipment; or place monitoring equipment or tools on potentially contaminated surfaces.
- If personnel do not fulfill these responsibilities, they will be denied site access.
- The buddy system shall be practiced at all times.

## **9.0 EMERGENCY PROCEDURES**

Cellular telephones will be available in the field work trucks for emergency communications. Emergency procedures are discussed in the following sections.

### **9.1 EMERGENCY PHONE NUMBERS**

#### **Emergency telephone numbers**

Fire/Police/Medical Emergency:	911
Poison Control Center:	(800) 342-9293
U.S. Coast Guard Emergency Response Team:	(800) 424-8802
Chemical Transportation Emergency Center (CHEMTREC):	(800) 424-9300

#### **Hospital Facilities**

Alameda Hospital	(510) 522-3700
Emergency Room	(510) 523-4357

#### **U&A Contacts:**

Douglas Sheeks (U&A CHSO)	(510) 832-2233
Gerry Slattery (U&A Program Manager)	(510) 832-2233

Injuries which require more than simple first aid measures on site should be treated by medical personnel. Note: The above emergency phone numbers were verified by U&A personnel on April 25, 1997.

### **9.2 MEDICAL FACILITY**

Injuries which require more than simple first aid measures on site should be treated by medical personnel at **Alameda Hospital** located at **2070 Clinton Avenue** (on the southeast corner of Clinton Avenue and Willow Street) in Alameda, California.

Directions to reach the hospital:

From the main gate:

- Follow Main Street to Atlantic Avenue. Turn left onto Atlantic Avenue heading east.

From the east gate:

- Drive straight onto Atlantic Avenue heading east.

From Atlantic Avenue heading east:

- Take Atlantic Avenue to Webster Street (California Highway 61).
- Turn right onto Webster Street heading south.
- Take Webster Street two blocks south to Buena Vista Avenue.
- Turn left onto Buena Vista Avenue heading east.
- Take Buena Vista Avenue for 1.7 miles east to Willow Street.
- Turn right onto Willow Street heading south.
- Take Willow Street nine blocks south to Clinton Avenue.
- The hospital is at 2070 Clinton Avenue on the southeast corner of Clinton Avenue and Willow Street.
- The emergency entrance is on Clinton Avenue.
- The parking lot is off of Willow Street.

Figure 9-1 shows the route to Alameda Hospital from NAS Alameda.

### **9.3 EMERGENCY RESPONSE PROCEDURES**

The SSO has the responsibility and authority for coordinating emergency response activities until the proper authorities arrive and assume control. In addition, the SSO has the responsibility of ensuring that emergency medical transport has full access to injured personnel.

When calling for assistance in an emergency situation, the following information should be provided:

- Name of caller
- Telephone number of caller's location
- Name(s) of person(s) exposed or injured
- Nature of emergency
- Actions taken

The recipient of the call should be allowed to hang-up first - **not** the caller.

Also, the SSO shall verify that the emergency medical facility will accept patients who may be contaminated or steps that must be taken to ensure that such patients will be accepted.

#### **9.4 EMERGENCY MEDICAL TREATMENT**

If a person is physically injured, Red Cross first-aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the person can be moved, he or she will be taken to the edge of the work area (on a stretcher, if needed), emergency first aid will be administered, and then the injured person will be transported to the hospital.

#### **9.5 EMERGENCY MEDICAL PROCEDURES**

For severe injuries, illnesses, or overexposure:

- Remove the injured or exposed person(s) from immediate danger.
- If possible, at least partial decontamination should be completed. Wash, rinse, and/or cut off protective clothing and equipment, and redress the victim in clean coveralls.
- If decontamination cannot be conducted, wrap the victim in blankets or plastic sheeting to reduce contamination of other personnel.

- Render emergency first aid and call an ambulance for transport to the hospital immediately. Notify emergency personnel of possible contaminants on site. This contaminant information should be sent with the victim to the hospital.
- Evacuate other personnel on site to a safe place until the SSO or FPM determines that it is safe to resume work.
- Report the accident to the PM, FPM, and CHSO immediately and complete the appropriate incident report form (see Attachment 7)

For minor injuries or illnesses:

- If needed, complete a full decontamination.
- Administer first aid. Minor injuries may be treated on site, but all injuries will be examined by trained medical personnel. Victims of serious bites or stings will be taken to the hospital.
- Notify the PM, FPM, and CHSO as soon as possible.

## 9.6 FIRST AID - CHEMICAL INJURY

If the injury to the worker is chemical in nature, the following first-aid procedures are to be implemented as soon as possible:

**Eye Exposure.** If a contaminated solid or liquid gets into the eyes, wash eyes immediately with sterile saline solution, lifting the lower and upper lids occasionally. Continue eye wash for 15 minutes. Cover the eye with a dry pad and obtain medical attention immediately.

**Skin Exposure.** If a contaminated solid or liquid gets on the skin, promptly wash contaminated skin for 15 minutes using soap or mild detergent and water. If solids or liquids penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Obtain medical attention immediately if symptoms warrant.

## 9.7 FIRST AID - PHYSICAL INJURY

If a physical injury occurs, the following first-aid procedures will be followed:

**Burns (minor).** Do not apply Vaseline or grease of any kind. Apply cold water until pain subsides. Cover with a wet sterile gauze dressing. Do not break blisters or remove tissue. Seek medical attention.

**Burns (severe).** Do not remove adhered particles of clothing. Do not apply ice or immerse in cold water. Do not apply ointment, grease, or Vaseline. Cover burns with thick sterile dressings. Keep burned feet or legs elevated. Seek medical attention immediately.

**Cuts.** Apply pressure with sterile gauze dressing and elevate the area until bleeding stops. Apply a bandage and seek medical attention.

**Eye Injury.** Keep the victim from rubbing the eye. Flush the eye with water or use available eye wash station. If a foreign object is in the eye, and flushing fails to remove the object, apply a dry, protective dressing and consult a physician.

**Fainting.** Keep the victim lying down with feet elevated. Loosen tight clothing. If victim vomits, roll him or her onto side or turn head to the side. If necessary, wipe out mouth. Maintain an open airway. Bathe face gently with cool water. Seek medical attention.

**Fracture.** Deformity of an injured part usually means a fracture. If fracture is suspected, splint the part as it lies. Do not attempt to move the injured part of the person. Seek medical attention immediately.

**Puncture Wounds.** If a puncture wound is deeper than skin surface, seek medical attention. Serious infection can arise unless proper treatment is received.

**Sprains.** Elevate injured part and apply ice bag or cold packs. Do not soak in hot water. If pain and swelling persists, seek medical attention.

**Unconsciousness.** Never attempt to give anything by mouth. Keep victim flat and maintain an open airway. If victim is not breathing, provide artificial respiration by mouth-to-mouth breathing and call for an ambulance immediately.

## 9.8 FIRE OR EXPLOSION

In the event of a fire, the Fire Department will be summoned immediately. If the area is not safe, evacuate the area immediately. If it is safe to do so, site personnel may:

- Use fire-fighting equipment available on site to control or extinguish the fire, if possible.
- Remove or isolate flammable or other hazardous materials that may contribute to the fire.

In the event of an explosion, all personnel shall be evacuated and the Fire Department notified immediately. No one shall re-enter the area until it has been cleared by fire or explosive safety personnel.

## 9.9 NATURAL DISASTERS

Natural disasters may occur at the site due to weather (including lightning and high winds) or seismic events. The following procedures will be followed in the event of a natural disaster:

- **Earthquakes.** In the event of a serious earthquake, stop work immediately, shut off all equipment, and evacuate the site. Work should not be resumed until a thorough site inspection has been completed by the SSO or FPM.
- **Lightning.** Persons should not work in open areas or near trees or outside equipment during lightning storms. Stop work and, if possible, clear the site until the storm passes.
- **High Winds.** If high winds are forecast, the site should be cleared before the winds become hazardous. Workers should be instructed to go to an appropriate shelter.

If an evacuation is required, all persons should be accounted for before leaving the site. Notify the PM and the FPM of any work stoppage due to natural disasters.

## 9.10 EMERGENCY EQUIPMENT

Emergency equipment will be stored at appropriate on-site locations selected during site mobilization. Emergency response equipment may be moved from one location to another based on changing locations of activities. The following is a list of emergency equipment that will be needed on site:

- Fire Extinguisher (20 pounds [lb.] A/B/C type)

- First-Aid Kit - at least one industrial first-aid kit will be provided and maintained fully stocked at the site
- Drinking Water or "Gatorade" or warm non-caffeinated drink
- Emergency eye wash solution/station rated for 15 minutes
- USCG-approved life or jackets or work vests (for work near water)
- At least one ring buoy with at least 90 feet of line attached shall be readily available for emergency rescue operations (for work near water)

## **9.11 ACCIDENT/INCIDENT REPORTING**

In the event of an incident, the PM, CHSO, FPM, and SSO will be notified. The following types of incidents are considered reportable:

- Physical injury (a log of the first aid administered on site will be kept)
- Fire, explosions, and flashes resulting from activities performed by U&A and its subcontractors
- Infractions of safety rules and requirements
- Unexpected chemical exposures
- Near accidents
- Vehicular accidents
- Property damage accidents
- Injuries to public persons
- Damage to private property

The following types of incidents are to be reported by the fastest available means to the SSO and CHSO:

- Those likely to result in death or permanent disability
- Those requiring hospitalization
- Those involving two or more employees

- Those that are likely to receive coverage by news media, so that families may be notified by the company beforehand, if possible
- Those involving collapse, cave-in, or other failure of structures or equipment
- Serious accidents involving equipment or vehicles

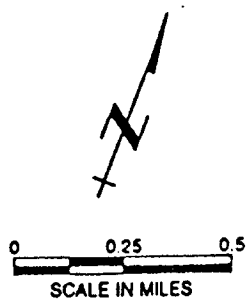
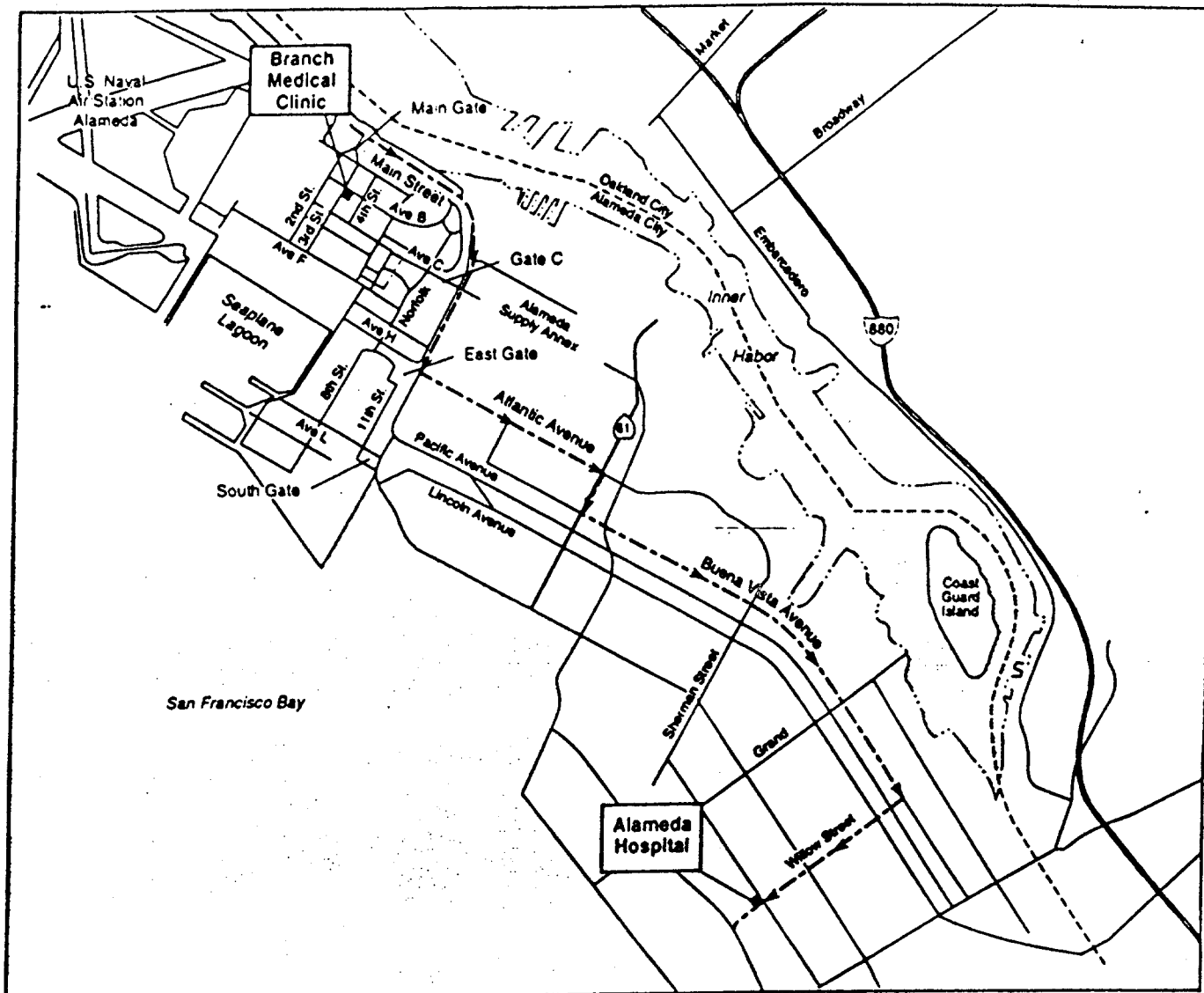
Work will be suspended to correct the cause of the incident and to modify this HSP addendum, if necessary.

An incident report form (see Attachment 7) must be submitted to the CHSO within 24 hours of any incident or accident that requires medical treatment, and within five days for other incidents that affect U&A personnel and their subcontractors. The SSO will complete this documentation. A worker's compensation form must also be submitted in the state in which an injured employee resides (Attachment 8). Following the incident, an incident investigation committee will be formed and an investigation committee report (see Attachment 7) will be completed. The CHSO will be responsible for forming the committee.

## 9.12 EMERGENCY COMMUNICATION PROCEDURES

The communication procedures shall be used as needed, and are shown below.

COMMUNICATION GESTURE	MEANING
Hand gripping throat	Out of air, can't breathe
Grip partner's wrists or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I'm all right, I understand
Thumbs down	No, negative



NAVAL AIR STATION ALAMEDA  
ALAMEDA, CALIFORNIA

HOSPITAL LOCATION MAP

FIGURE 9-1

## REFERENCES

- California Occupational Safety and Health Administration (Cal/OSHA), California Code of Regulations (CCR), Title 8, Part 5192. "Hazardous Waste Operations and Emergency Response."
- Occupational Safety and Health Administration (OSHA), Title 29, Code of Federal Regulations (CFR), Part 1910.120. "Hazardous Waste Operations and Emergency Response."
- OSHA, Title 29, Code of Federal Regulations, Part 1910.134 "Respiratory Protection."
- PRC Environmental Management Inc. (PRC), 1993a. "CLEAN I Health and Safety Plan," Revision 2. April.
- PRC, 1997. "Base-Wide Health and Safety Plan, NAS Alameda, California." July.
- PRC, 1995. "CLEAN II Health and Safety Plan," Revision 1.
- Uribe & Associates (U&A), 1995a. "Field Injury/Illness Prevention Program," revised July.
- U&A, 1995b. "Hazards Communications Program," revised July.
- U&A, 1995c. "Respiratory Protection Program," revised July.
- U.S. Army Corps of Engineers, 1996. "Engineering Manual (EM) 385-1-1." September.
- U.S. Department of the Navy, 1992. "Navy/Marine Corps Installation Restoration Manual." February.

**ATTACHMENT 1**

**SAFETY COMPLIANCE AGREEMENT AND DOCUMENTATION OF SITE SAFETY BRIEFING**  
**(Two Sheets)**

# SAFETY COMPLIANCE AGREEMENT AND DOCUMENTATION OF SITE SAFETY BRIEFING

DATE \_\_\_\_\_

TIME \_\_\_\_\_

SITE LOCATION \_\_\_\_\_

PROJECT NUMBER \_\_\_\_\_

SITE SAFETY OFFICER \_\_\_\_\_

**TOPICS COVERED DURING BRIEFING:**

- |  |  |
|--|--|
| <p>_____ EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE</p> <p>_____ HEALTH EFFECTS OF CHEMICAL HAZARDS</p> <p>_____ PHYSICAL HAZARDS ON SITE</p> <p>_____ LEVELS OF PROTECTION REQUIRED</p> <p>_____ ROUTE TO THE HOSPITAL</p> <p>_____ LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIRE FIGHTING EQUIPMENT ...)</p> <p>_____ VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ</p> | <p>_____ MONITORING PROCEDURES</p> <p>_____ ACTION LEVELS</p> <p>_____ DECONTAMINATION PROCEDURES</p> <p>_____ LOCATION OF EMERGENCY NUMBERS</p> |
|--|--|

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition, I have been verbally briefed on the topics noted above.

**DOCUMENTATION (SSO MUST SEE  
VERIFICATION BEFORE INITIALING COLUMN)**

ATTENDEES: NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) _____ (signature) _____				
2. (print) _____ (signature) _____				
3. (print) _____ (signature) _____				
4. (print) _____ (signature) _____				
5. (print) _____ (signature) _____				
6. (print) _____ (signature) _____				

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition, I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE  
VERIFICATION BEFORE INITIALING COLUMN)

ATTENDEES:		40 HR	FIT	MEDICAL
NAME	COMPANY			
7. (print) _____ (signature) _____				
8. (print) _____ (signature) _____				
9. (print) _____ (signature) _____				
10. (print) _____ (signature) _____				
11. (print) _____ (signature) _____				
12. (print) _____ (signature) _____				

**ATTACHMENT 2**

**29 CFR 1926.106 - WORKING OVER OR NEAR WATER**  
**(One Sheet)**

**29 CFR 1926.106 Working over or near water.**

- (a) Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jacket or buoyant work vests.
- (b) Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.
- (c) Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.
- (d) At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.

### **ATTACHMENT 3**

**(Ten Sheets)**

**Occupational Health Exposure Guidelines - Volatile Organics**

**Occupational Health Exposure Guidelines - Metals, Pesticides, PCBs, and Others**

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - VOLATILE ORGANICS**  
(Sheet 1 of 4)

Site Contaminant	Federal - OSHA PEL (ppm)	Cal-OSHA PEL (ppm)	NIOSH REL (ppm)	ACGIH TLV-TWA (ppm)	NIOSH IDLH (ppm)	Ionization Potential (eV)	Routes of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
<b><u>Volatile Organics</u></b>								
Acetone	750	750	250	750	20,000	9.69	INH, ING CON	Irrit eyes, nose, throat; head; dizz; dermatitis.
Chlorobenzene	75	75	No REL	75	2,400	9.07	INH, ING CON	Irrit eyes, nose, and skin; drowsiness, incoherence.
2,4-Dimethylphenol	No PEL		No REL	No TLV	NA	No Value	INH, ABS	Toxic.
n-Hexane	50	50	50	50	5,000	10.18	INH, CON ING	Li-head, nau, head, numb extremities, muscle weakness, irrit to eyes, nose, dermatitis, giddiness, chemical pneumonia.
1,1-Dichloroethane	100	100	100	100	4,000	11.06	INH, ING	CNS depressant, skin irrit, liver and kidney damage.
1,2-Dichloroethene	1	1	Ca	5	NA	NA	INH	Dangerous fire risk.
1,2-Dichloroethene	200	200	200	200	4,000	9.65	INH, ING	Irrit eyes and resp system; CNS depressant.
1,2-Dichloropropane	75	75	75	Ca	2,000	10.87	INH, ING	Eye irritant, drowsiness, lightheadedness, skin irritant, carcinogen.
Carbon Disulfide	4	4	1	10	500	10.08	INH, ING ABS, CON	Dizz, head, poor sleep, flg, ner, anorexia, low-wgt, psychosis, polynau, Parkinsons-like syndrome, ocular changes, coronary heart disease, gastritis, kidney, liver damage, eye, skin burns, derm.
Chloroethane	1,000	1,000	No REL	1,000	20,000	10.97	INH, ING ABS, CON	Incoherence, inebriation, abdominal cramps, cardiac arrhythmia, cardiac arrest, liver and kidney damage.
Methyl ethyl ketone	200	200	200	200	200	9.54	INH, ING CON	Irrit eyes, nose; head dizz; vomit.

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - VOLATILE ORGANICS**  
(Sheet 2 of 4)

Site Contaminant	Federal - OSHA PEL (ppm)	Cal-OSHA PEL (ppm)	NIOSH REL (ppm)	ACGIH TLV-TWA (ppm)	NIOSH IDLH (ppm)	Ionization Potential (eV)	Routes of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
Benzene	1	1	0.1(Ca) <sup>c</sup>	10(A2) <sup>f</sup>	Ca <sup>d</sup>	9.24	INH, ABS,	Irrit eyes, nose, resp sys; giddiness; head, nau, staggered gait.
Carbon Tetrachloride	2	2(S) <sup>e</sup>	2(STEL) <sup>h</sup> (Ca) <sup>c</sup>	5(A2) <sup>h</sup> (S) <sup>e</sup>	Ca <sup>d</sup> [300]	11.47	INH, ABS ING, CON	CNS depres; nau, vomit; liver, kidney damage; skin irrit; [carc].
Ethylbenzene	100	100	100	100	2,000	8.76	INH, ING, CON	Irrit eyes, muc memb; head; derm; narco, coma.
Methylene Chloride	500	100	Ca <sup>d</sup>	50(A2) <sup>f</sup>	Ca <sup>d</sup> [5,000]	11.35	INH, ING, CON	Ftg, weak, sleepiness, li-head; limbs numb, tingle; nau; irrit eyes, skin; [carc].
Toluene	100	100(S)	100	100	2,000	8.82	INH, ABS, ING, CON	Ftg, weak; confusion, euphoria, dizz, head; dilated pupil, lacrimation; ner, musc flg, insom; pares; derm.
1,1,1-Trichloroethane	350	350	350(C) <sup>e</sup>	350	1,000	11.00	INH, ING, CON	Head, lass, CNS depressant, poor equilibrium, irrit eyes, derm; card arrhy.
Trichloroethene	50	25	25(Ca) <sup>d</sup>	50	Ca <sup>d</sup> [1,000]	9.45	INH, ING, CON	Head, vertigo, vis dist, tremors, somnolence, nau, vomit; irrit eyes; derm; card arrhy, pares, [carc].
Trichlorofluoromethane	1,000(C)	1,000(C)	1,000(C)	1,000(C)	10,000	11.77	INH, ING, CON	Incoherence, tremors; derm; frostbite; card arrhy, card arrest.
Xylenes	100	100	100	100	1,000	8.44/8.56	INH, ABS, ING, CON	Dizz, excitement, drow, incoherence, staggered gait, irrit eyes, nose, throat; corneal vacuolization; anor nau, vomiting, abdom pain; derm.

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - VOLATILE ORGANICS**  
(Sheet 3 of 4)

Site Contaminant	Federal - OSHA PEL (ppm)	Cal-OSHA PEL (ppm)	NIOSH REL (ppm)	ACGIH TLV-TWA (ppm)	NIOSH IDLH (ppm)	Ionization Potential (eV)	Routes of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
<b><u>Fuels, Oils, Solvent Products</u></b>								
AVGAS	(See benzene)						INH, ING, CON	CNS depress; dizz, head, inco, anes; resp arrest; pulm irrit, pulm edema; stomach irrit.
Bunker "C" Fuel	100	100	100	100	10,000	No Value	INH, ING	Head, nau, confusion, drow, convuls, possibly coma; pulm injury; skin irrit.
Diesel Fuel	(See benzene, toluene, xylene, and benzo(a) pyrene)						INH, ING CON	Head; nau; CNS depress, anes; pulm irrit, edema; kidney, liver damage.
Gasoline	(See benzene, ethylbenzene, toluene, and xylenes)							
Hydraulic Fluid/ Motor Oils	No PEL	No PEL	No REL	No TLV	NA <sup>d</sup>	No Value	ING, INH	Gastro irrit; pulm irrit.
JP-5	(See benzene)						ING, INH, CON	Irrit; eyes, nose, stomach; pulm edema.
JP-7	(See benzene)						ING, INH, CON	Irrit; eyes, nose, stomach; pulm edema.
PD-680	100	100	100	100	29,500 mg/m <sup>3</sup>		INH, CON ING	CNS depressant; dizz, head; irrit nose, throat, eyes; derm.

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - VOLATILE ORGANICS**  
(Sheet 4 of 4)

Site Contaminant	Federal - OSHA PEL (ppm)	Cal-OSHA PEL (ppm)	NIOSH REL (ppm)	ACGIH TLV-TWA (ppm)	NIOSH IDLH (ppm)	Ionization Potential (eV)	Routes of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
<b><u>Base/Neutral/Acid Extractables</u></b>								
Naphthalene	10	10	10	10	500	8.12	INH, ING CON, ABS	Eye irrit, head, confusion, excitement, malaise, nausea, vomiting, abdominal pain, irritation to bladder; profuse sweating, jaundice, renal shutdown, dermat.
O-chlorobenzylidene	0.05	0.05	0.05	0.05	0.25	NA	INH, ING CON, ABS	Pain, burning eyes, lacrimation, conjunctivitis, erythema to eyelids, irritant to throat, cough, chest constriction, headache, blepharospasm.
Phenol	5(S) <sup>c</sup>	5(S) <sup>c</sup>	5(S) <sup>c</sup>	5(S) <sup>c</sup>	250	8.5	INH, ABS, ING, CON	Irrit eyes, nose, throat, anor, low-wgt, weak, muscle ache, pain; dark urine; cyan; liver, kidney damage; skin burns; dermat; ochronosis; tremor, convuls, twitch.
Methylnaphthalene	No PEL	No PEL	No REL	No TLV	NA	7.955	INH, CON	Skin irrit.

- <sup>a</sup> NIOSH abbreviations: ABS (skin absorption); CON (skin and/or eye contact); ING (ingestion); and INH (inhalation).
- <sup>b</sup> NIOSH abbreviations: abdom (abdominal); anes (anesthesia); anos (anosmia), anor (anorexia); arrhy (arrhythmias); carc (carcinogen); card (cardiac); CNS (central nervous system); convuls (convulsions); CVS (cardiovascular system); cyan (cyanosis); dermat (dermatitis); diarr (diarrhea); dist (disturbance); dizz (dizziness); drow (drowsiness); dysp (dyspnea), fig (fatigue); GI (gastrointestinal); head (headache); hema (hematuria), inco (incoherence); insom (insomnia), irrit (irritation); irrit (irritability), lass (lassitude); li-head (light headedness); low-wgt (low-weight); muc memb (mucous membranes); musc (muscle), narco (narcosis); nau (nausea); ner (nervousness); num (numbness); pares (paresthesia); peri neur (peripheral neuropathy), photo (photophobia); polyneur (polyneuropathy); pulm (pulmonary), resp (respiratory), resp irrit (respiratory irritation), resp sys (respiratory system); subs (substernal), vis dist (visual disturbance).
- <sup>c</sup> (S) OSHA and ACGIH skin notation (potential contribution to overall exposure via the cutaneous route).
- <sup>d</sup> NIOSH notation indicating that an IDLH has not been assigned.
- <sup>e</sup> (C) OSHA, NIOSH, ACGIH notation for ceiling limit. An employee's exposure must not exceed the ceiling limit during any part of the workday. If instantaneous monitoring is not feasible, then the ceiling limit will be assessed based on a 15-minute time weighted average (TWA) exposure, which must not be exceeded at any time during a work day.
- <sup>f</sup> ACGIH notations (A1) confirmed human carcinogen; (A2) suspect human carcinogen.
- <sup>g</sup> (Ca) NIOSH notation for carcinogen
- <sup>h</sup> 60-minute STEL
- <sup>i</sup> 10-minute STEL

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - METALS, PESTICIDES, PCBs, AND OTHERS**  
(Sheet 1 of 6)

Site Contaminant	Federal-OSHA PEL (mg/m <sup>3</sup> )	Cal-OSHA PEL (mg/m <sup>3</sup> )	REL TWA (mg/m <sup>3</sup> )	ACGIH TLV-TWA (mg/m <sup>3</sup> )	IDLH (mg/m <sup>3</sup> )	Route of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
<b>Metals</b>							
Beryllium	0.002	0.002	0.0005	0.002	10	INH	Resp symptoms, weakness, flg, weight loss, [carc].
Antimony	0.5	0.5	0.5	0.5	80	INH, CON	Irrit nose, throat, mouth; cough, dizz, head, nau, vomit, diarr, stomach cramps; insom, anor, irrit skin; unable to smell properly, cardiac abnormalities.
Arsenic	0.01	0.01	0.002	0.2	100	INH, ING	Ulceration of nasal septum, derm. GI dist, peripheral neuropathy, resp irrit, hyperpigmentation of skin, [carc].
Manganese	5	5	1	5	NA	INH, ING	Parkinsons; asthenia, insom, mental confusion, metal fume fever, dry throat, cough, tight chest, dysp, rales; flu-like fever, low back pain, vomit, malaise, flg.
Zinc	10	10	5	10	NA	INIT	Sweet, metallic taste, dry throat, cough, chills, fever, tight chest, dysp, rales, reduced pulm function, head, blurred vision, muscle cramps, low back pain, nau, vomit, flg, lass, malaise.
Barium	0.5	0.5	0.5	0.5	1,100	INH, ING, CON	Upper resp irrit; GI; musc spasm; slow pulse, extra systoles; hypokalemia; irrit eyes, skin; skin burns.

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - METALS, PESTICIDES, PCBs, AND OTHERS**  
(Sheet 2 of 6)

Site Contaminant	Federal-OSHA PEL (mg/m <sup>3</sup> )	Cal-OSHA PEL (mg/m <sup>3</sup> )	REL TWA (mg/m <sup>3</sup> )	ACGIH TLV-TWA (mg/m <sup>3</sup> )	IDLH (mg/m <sup>3</sup> )	Route of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
Cadmium	0.2	0.05	Ca <sup>a</sup>	0.05(A2) <sup>f</sup> [50]	Ca <sup>a</sup>	INH, ING	Pulm edema, dysp, cough, tight chest, subs pain; head; chills; muscle aches; nau, vomit, diarr; anos, emphysema; proteinuria; mild anemia; [carc].
Chromium	1	0.5	0.5	0.5	NA <sup>a</sup>	INH, ING	Histologic fibrosis of lung.
Copper	1	1	1	1	NA <sup>a</sup>	INH, ING CON	Irrit nasal muc memb, pharynx, nasal perforation; eye irrit; metallic taste; derm.
Lead	0.05	0.05	0.1	0.15	700	INH, ING, CON	Weak, lass; insom; facial pallor; paleyc, anor, low-wgt, malnutrition constipation, abdom pain, colic; anemia; gingival lead line; tremors, paralysis, para wrist, ankles; encephalopathy.
Mercury	0.05(S) <sup>a</sup>	0.05(S) <sup>a</sup>	0.05(S) <sup>a</sup>	0.05(S) <sup>a</sup>	28	INH, ABS CON	Cough, chest pain, dysp, bronchitis pneuitis; tremor; insom; irrity; indecision; head, flg, weak; stomatitis, salivation; GI dist, anor, low-wgt, proteinuria; irrit eyes, skin.
Nickel	1	1	0.015(Ca) <sup>a</sup>	1	Ca <sup>a</sup> [7ppm]	INH, ING, CON	Sensitization derm; allergic asthma; pneuitis; [carc].
Silver	0.01	0.1	0.01	0.1	NA <sup>a</sup>	INH, ING CON	Blue-gray eyes, nasal septum, throat, skin; irrit skin, ulceration; GI dist.
Vanadium	0.05	0.05	0.05	0.05(C) <sup>a</sup>	70	INH, ING	Irrit eyes; green tongue; metallic taste, eczema; cough; fine rales, wheez,

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - METALS, PESTICIDES, PCBs, AND OTHERS**  
(Sheet 3 of 6)

Site Contaminant	Federal-OSHA PEL (mg/m <sup>3</sup> )	Cal-OSHA PEL (mg/m <sup>3</sup> )	REL TWA (mg/m <sup>3</sup> )	ACGIH TLV-TWA (mg/m <sup>3</sup> )	IDLH (mg/m <sup>3</sup> )	Route of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
<b><u>Coal Tar Pitch Volatiles</u></b> (benzene soluble fraction)							
Rhenanthrene	0.2	0.2	Ca	0.2(A1)	Ca <sup>a</sup> [700]	INH, CON	Derm, bronchitis, [canc].
Fluorene	No PEL	No PEL	No REL	No TLV	NA <sup>a</sup>	INH, CON	Skin/eye irrit; head, dizz, drow, nau.
<b><u>Inorganics</u></b>							
Chromic Acid (as Cr)	0.1(C) <sup>i</sup>	No PEL	0.001(Ca)	0.05	Ca <sup>a</sup> [30]	INH, ING, CON	Resp sys irrit, nasal septum perf; liver, kidney damage; leucyt, leupen, monocy, eosin; eye inj, conj; skin ulcer, sens derm; [canc].
Cyanide	5	5(S) <sup>a</sup>	4.7(C) <sup>i</sup>	5	50	INH, ABS,  ING, CON	Asphy and death can occur; weak, head, conf; nau, vomit; incr rate resp; slow  gasping resp; irrit eyes, skin.
<b><u>Pesticides</u></b>							
DDE	No PEL	No PEL	No REL	No TLV	NA	INH, ING ABS, CON	As for DDT, paresthesia tongue, lips, face, tremor, apprehensiveness, dizziness, confusion, malaise, headache, fig, convulsions, vomit, irrit eyes and skin, [canc].
DDD	No PEL	No PEL	No REL	No TLV	NA	INH, ING ABS, CON	Toxic.
Endrin	0.1	0.1	0.5	0.1	2,000	INH, ING	Epileptiform, convulsions, stupor, headache, dizz, abdom discomfort, nau, vomit, insom, aggressiveness, confusion, lethargy weakness, anor.

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - METALS, PESTICIDES, PCBs, AND OTHERS**  
(Sheet 4 of 6)

Site Contaminant	Federal-OSHA PEL (mg/m <sup>3</sup> )	Cal-OSHA PEL (mg/m <sup>3</sup> )	REL TWA (mg/m <sup>3</sup> )	ACGIH TLV-TWA (mg/m <sup>3</sup> )	IDLH (mg/m <sup>3</sup> )	Route of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
Endosulfan	0.1	0.1	0.1	0.1	NA	INH, ING ABS, CON	Toxic.
Heptachlor	0.5	0.5	0.5	0.5	700	INH, ING ABS, CON	In animals: tremors, convulsions; liver damage, [carc].
Lindane	0.5	0.5	0.5	0.5	1,000	INH, ING CON, ABS	Irrit eyes, nose, throat, head, nau, chronic convulsions, resp difficulty; cyonosis, aplastic anemia, skin irrit, muscle spasm.
4,4'-DDT	1(S)*	1	0.5(Ca)*	1	Ca* [NA]	INH, ABS, ING, CON	Pares tongue, lips, face; tremor; apprehension, dizz, confusion, malaise; head; convuls; paresis hands; vomiting; irrit eyes, skin; [carc].
Chlordane	0.5(S)*	0.5(S)*	0.5(S)*(Ca)*	0.5(S)*	Ca* [500]	INH, ABS ING, CON	Blurred vision; confusion; ataxia; delirium; cough; abdom pain, nau, vomit, diarr; irrity, tremor, convuls; anuria.
Diazinon	0.1(S)*	0.1(S)*	0.1(S)*	0.1(S)*	NA <sup>d</sup>	ING, CON	Cholinesterase inhibition; weakness head, tightness in chest, blurred vision; nau, vomit, diarr, abdom cramps; slurred speech, sweating, salivation.
Gamma-BHC (Lindane)	0.5(S)*	0.5(S)*	0.5	0.5(S)*	1,000	INH, ABS, ING, CON	Irrit eyes, nose, throat; head; nau; clonic convuls; resp difficulty; cyan; aplastic anemia; skin irrit; musc spasm.
Malathion	10(S) <sup>ca</sup>	10(S)*	10(S)*	10(S)*	5,000	INH, ABS, ING, CON	Miosis, aching eyes, blurred vision, lac; eye, skin irrit; saliv; anor, nau, vomit, abdom cramps, diarr, gidd, conf, ataxia; rhin, head, tight chest, wheez, lar spasm.

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - METALS, PESTICIDES, PCBs, AND OTHERS**  
(Sheet 5 of 6)

Site Contaminant	Federal-OSHA PEL (mg/m <sup>3</sup> )	Cal-OSHA PEL (mg/m <sup>3</sup> )	REL TWA (mg/m <sup>3</sup> )	ACGIH TLV-TWA (mg/m <sup>3</sup> )	IDLH (mg/m <sup>3</sup> )	Route of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
<b><u>Herbicides</u></b>							
Bromacil	10	10	10	11	NA <sup>d</sup>	ING, CON	Mild eye irritant.
Chlorvar	No PEL	No PEL	No REL	No TLV	NA <sup>d</sup>	CON	
2,4-D	10	10	10	No TLV	500	INH, ABS, ING, CON	Weak, stupor; hyporeflexia; muscle twitch, convuls; derm.
Diuron	10	10	10	10	NA <sup>d</sup>	CON	Eye, nose, throat, skin irrit.
Krovar I	(See bromacil and diuron)					CON	Irrit eyes, nose, and throat.
Princep (Simazine)	No PEL	No PEL	No REL	No TLV	NA <sup>d</sup>	CON	Irrit eyes, skin.
Roundup (glyphosate)	No PEL	No PEL	No REL	No TLV	NA <sup>d</sup>	CON	Irrit eyes, skin.
Telvar	No PEL	No PEL	No REL	No TLV	NA <sup>d</sup>	CON	Irrit eyes, nose, throat, skin.
<b><u>PCBs</u></b>							
Arochlor - 1260 Chlorodiphenyl (42% chlorine)	1(S) <sup>e</sup>	No PEL	0.001(Ca) <sup>e</sup>	1(S) <sup>e</sup>	Ca <sup>e</sup> [10]	INH, ABS ING, CON	Irrit eyes; chloracne; liver damage; [canc].
Arochlor - 1254	0.5(S) <sup>e</sup>	No PEL	0.001(Ca) <sup>e</sup>	0.5(S) <sup>e</sup>	Ca <sup>e</sup> [5]	INH, ABS ING, CON	Irrit eyes, skin; acne-form derm; [canc].

**OCCUPATIONAL HEALTH EXPOSURE GUIDELINES - METALS, PESTICIDES, PCBs, AND OTHERS**  
(Sheet 6 of 6)

Site Contaminant	Federal-OSHA PEL (mg/m <sup>3</sup> )	Cal-OSHA PEL (mg/m <sup>3</sup> )	REL TWA (mg/m <sup>3</sup> )	ACGIH TLV-TWA (mg/m <sup>3</sup> )	IDLH (mg/m <sup>3</sup> )	Route of Exposure <sup>a</sup>	Symptoms <sup>b</sup>
<b>Others</b>							
Dioxin-furan	No PEL	No PEL	No REL	No TLV	NA	INH, ABS ING	Chloracne, metabolic disorders; [suspect carc].

- NIOSH abbreviations: ABS (skin absorption); CON (skin and/or eye contact); ING (ingestion); and INH (inhalation).
- NIOSH abbreviations: abdom (abdominal); anes (anesthesia); anor (anorexia); anos (anosmia); arrhy (arrhythmias); carc (carcinogen); card (cardiac); CNS (central nervous system); convuls (convulsions); CVS (cardiovascular system); cyan (cyanosis); derm (dermatitis); diarr (diarrhea); dist (disturbance); dizz (dizziness); drow (drowsiness); dysp (dyspnea); fig (fatigue); GI (gastrointestinal); head (headache); hema (hematuria); inco (incoordination); insom (insomnia); irrit (irritation); irrity (irritability); lass (lassitude); low-wgt (low-weight); muc memb (mucous membranes); musc (muscle) narco (narcosis); nau (nausea); ner (nervousness); pares (paresthesia); peri neur (peripheral neuropathy); photo (photophobia); polyneur (polyneuropathy); pulm (pulmonary); resp (respiratory); resp irrit (respiratory irritation); resp sys (respiratory system); subs (substernal) vis dist (visual disturbances).
- (S) OSHA and ACGIH skin notation (potential contribution to overall exposure via the cutaneous route).
- NIOSH notation indicating that an IDLH has not been assigned.
- (C) OSHA, NIOSH, ACGIH notation for ceiling limit. An employee's exposure must not exceed the ceiling limit during any part of the workday. If instantaneous monitoring is not feasible, then the ceiling limit will be assessed based on a 15-minute time weighted average (TWA) exposure, which must not be exceeded at any time during a work day.
- ACGIH notations (A1) confirmed human carcinogen; (A2) suspect human carcinogen.
- (Ca) NIOSH notation for carcinogen.
- Respirated Fraction
- 10-minute STEL
- As CrO<sub>3</sub>

**ATTACHMENT 4**

**DAILY HEALTH AND SAFETY FORM**  
**(One Sheet)**

**DAILY HEALTH & SAFETY FORM**

PROJECT NAME:

DATE:

LOCATION:

SITE NAME/NO.:

SITE SAFETY OFFICER:

ADDRESS:

WEATHER CONDITIONS:

DESCRIPTION OF SITE ACTIVITIES INCLUDING LEVEL OF PROTECTION:

PERSONNEL ON SITE INCLUDING SUBCONTRACTORS:

DID DAILY HEALTH & SAFETY MEETING TAKE PLACE?  
PROVIDE BRIEF SUMMARY DESCRIPTION OF MEETING:☐ NO ☐ YES

DID ANY ACCIDENTS OR INJURIES OCCUR?

☐ NO ☐ YES

IF YES, WAS DA FORM 285 COMPLETED?

☐ NO ☐ YES

DATE SUBMITTED: \_\_\_\_\_

WAS USAEC SAFETY OFFICE NOTIFIED?

☐ NO ☐ YESWAS WORKERS COMPENSATION FORM  
COMPLETED?☐ NO ☐ YES

PROVIDE LIST OF SPECIAL EQUIPMENT OPERATION WITHIN THE EXCLUSION ZONE:

LIST AIR MONITORING EQUIPMENT AND CALIBRATION DATES:

ATTACH PLAN DRAWING OF SITE AND EXCLUSION ZONE(S) OR DESCRIBE:

LIST ANY CONDITIONS OR ACTIONS THAT WERE NOT CONSISTENT WITH THE H&amp;SP:

LIST ANY CHANGES IN THE OPERATION:

WAS SITE SAFETY OFFICER INFORMED OF NON-COMPLIANCE WITH H&SP?  
PROVIDE EXPLANATION:☐ NO ☐ YESWAS CORRECTIVE ACTION IMPLEMENTED?  
PROVIDE EXPLANATION:☐ NO ☐ YES

LIST ANY CHANGES IN LEVEL OF PROTECTION:

COMMENTS INCLUDING DESCRIPTIONS OF ANY UNUSUAL OCCURRENCE OR PHYSICAL COMPLAINTS. LIST H&amp;S MEETING ATTENDEES:

SIGNATURE \_\_\_\_\_

DATE \_\_\_\_\_

**ATTACHMENT 5**

**ORGANIC VAPOR DETECTOR CALIBRATION RECORD**  
**(One Sheet)**

# ORGANIC VAPOR DETECTOR CALIBRATION RECORD

## INSTRUMENT

MODEL NUMBER

SERIAL NUMBER

LAMP TYPE

CAL. GAS &amp; LOT NO.

[illegible]

NOTE: CAL - Calibration

**ATTACHMENT 6**

**WASTE PROFILE AND TRACKING FORMS AND COMPLETION INSTRUCTIONS**

**(Nine Sheets)**

**ITEM 1: DRUM LABEL**

**ITEM 2: DERIVED WASTE DISPOSITION FORM**

**ITEM 3: INVESTIGATION DERIVED WASTE PROFILE FORM**

**ITEM 4: INSTRUCTIONS FOR COMPLETING THE INVESTIGATION DERIVED  
WASTE FORM**



URIBE & ASSOCIATES ENVIRONMENTAL CONSULTING SERVICES

**THE CONTENTS WERE GENERATED FROM AN ENVIRONMENTAL INVESTIGATION**

**THIS CONTAINER HAS:**

**SOIL**

**SITE #**

**GROUND WATER**

**MONITORING WELL/  
SOIL BORING NAME**

**PPE/Disposal Equipment**

**DEPTH**

**DECONTAMINATION  
FLUIDS**

**DATE SEALED/OPENED**

**OTHER:**

**VOLUME**

**EMERGENCY CONTACT:**

Uribe & Associates  
2930 Lakeshore Avenue  
Suite Two Hundred  
Oakland, California 94610  
(510) 832-2233

**DRUM #**

**THIS CONTAINER WILL BE APPROPRIATELY LABELED AND THE CONTENTS DISPOSED OF ACCORDING TO  
FEDERAL AND LOCAL REQUIREMENTS WHEN THE LABORATORY RESULTS ARE KNOWN**

**HANDLE WITH CARE**

Form WPP Drum Label 9-2-96 OX/HK



URAN &amp; ASSOCIATES ENVIRONMENTAL CONSULTING SERVICES

PROJECT NO.:

**DERIVED WASTE DISPOSITION RECORD**

Form 107

PAGE \_\_\_\_ OF \_\_\_\_

SITE NAME:

SITE ID NO.:

DATE:

LOCATION OF WASTE ON SITE:  
(INCLUDE MAP IF APPROPRIATE)

WASTE TYPE (AIR, WATER, SOIL)

METHOD OF WASTE GENERATION

VOLUME OF WASTE:

MODE OF CONTAINMENT:

ARE WASTES OTHER THAN THE WASTE DESCRIBED ABOVE STORED ON THIS SITE?

☐ NO ☐ YES IF YES, PLEASE DESCRIBE.

COMMENTS:

SIGNATURE

DATE

Frank Wip DWD Record 8/8/98 OX FC

## U.S. NAVY, ENGINEERING FIELD ACTIVITY WEST INVESTIGATION-DERIVED WASTE PROFILE

Complete one form for each waste stream generated at each site. See instructions for detailed information about this form.

### 1.0 GENERATOR INFORMATION

Facility Name \_\_\_\_\_  
 Site Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

USEPA ID Number \_\_\_\_\_  
 Technical Contact \_\_\_\_\_  
 Phone \_\_\_\_\_  
 Fax \_\_\_\_\_  
 CTO Number \_\_\_\_\_

### 2.0 WASTE DESCRIPTION

Waste Description \_\_\_\_\_  
 Is this waste regulated by USEPA or Cal/EPA? \_\_\_\_\_ Waste codes \_\_\_\_\_ CLIN \_\_\_\_\_  
 LDR Subcategory \_\_\_\_\_  
 Wastewater or Nonwastewater? (see instructions) \_\_\_\_\_  
 Concentration Standard per §268.41? \_\_\_\_\_  
 Concentration Standard per §268.43? \_\_\_\_\_  
 Technology-Based Standard §268.42? \_\_\_\_\_  
 Special Handling Instructions \_\_\_\_\_

### 3.0 TRANSPORTATION INFORMATION

DOT Proper Shipping Name \_\_\_\_\_  
 DOT Hazard Class \_\_\_\_\_ UN/NA Number \_\_\_\_\_ RQ \_\_\_\_\_  
 Packaging Description \_\_\_\_\_

### 4.0 PHYSICAL PROPERTIES

Color _____			
Odor _____			
	<u>Ave.</u>	<u>Min.</u>	<u>Max.</u>
pH _____	_____	_____	_____
Specific Gravity _____	_____	_____	_____
Flash point _____	_____	_____	_____
(Method): _____	_____	_____	_____
BTU/lb _____	_____	_____	_____

Liquid Layering \_\_\_\_\_  
 Physical State \_\_\_\_\_  
 Viscosity \_\_\_\_\_  
 Yard-Pound Factor \_\_\_\_\_ x YD = LB  
 % Halogens \_\_\_\_\_  
 % Liquids \_\_\_\_\_  
 % Sludge \_\_\_\_\_  
 % Solids \_\_\_\_\_  
 % Water \_\_\_\_\_

## 4.0 PHYSICAL PROPERTIES (Continued)

Acid Reactive	Y	N	Biological	Y	N	Corrosive	Y	N
Dioxin	Y	N	Explosive	Y	N	Flammable	Y	N
Oxidizer	Y	N	Pesticide	Y	N	Herbicide	Y	N
Poison	Y	N	Pumpable	Y	N	Pyrophoric	Y	N
Radioactive	Y	N	RCRA Reactive	Y	N	Shock Sensitive	Y	N
Wastewater	Y	N	Water Reactive	Y	N	Other		

## 5.0 TOXICITY CHARACTERISTICS

U.S EPA Waste Code	Contaminant	Level (mg/L)	Federal Regulated Level	California	
				STLC	TTLIC
	Aldrin			0.14	1.4
	Antimony			15	500
D004	Arsenic		5.0	5.0	500
	Asbestos				1.0%
D005	Barium		100.0	100.0	10,000
D018	Benzene		0.5	0.75	75
	Beryllium			1.0	100
D006	Cadmium		1.0		
D019	Carbon Tetrachloride		0.5		
D020	Chlordane		0.03	0.25	2.5
D021	Chlorobenzene		100.0		
D022	Chloroform		6.0		
D007	Chromium (Total)		5.0	5	2,500
	Chromium (Trivalent)			5	2,500
	Chromium (Hexavalent)			5	500
	Cobalt			80	8,000
	Copper			25	2,500
D023	o-Cresol		200.0		
D024	m-Cresol		200.0		
D025	p-Cresol		200.0		
D016	2,4-D		10.0	10.0	100
	DDT, DDE, DDD			0.1	1.0
D027	1,4-Dichlorobenzene		7.5		
D028	1,2-Dichloroethane		0.5		
D029	1,1-Dichloroethylene		0.7		
	Dieldrin			0.8	8.0
D030	2,4-Dinitrotoluene		0.13		
	Dioxin (2,3,7,8, - TCDD)			0.001	0.01
D012	Endrin		0.02	0.02	0.2
	Fluoride salts			180	18,000
D031	Heptachlor (& its epoxide)		0.008	0.47	4.7
D032	Hexachlorobenzene		0.13		
D033	Hexachlorobutadiene		0.5		
D034	Hexachloroethane		3.0		
	Kepone			2.1	21
D008	Lead		5.0	5.0	1,000
	Lead components, organic				13
D013	Lindane		0.4	0.4	4.0
D009	Mercury		0.2	0.2	20
D014	Methoxychlor		10.0	10	100
D035	Methyl ethyl ketone		200.0		
	Mirex			2.1	21
	Molybdenum			350	3,500

**5.0 TOXICITY CHARACTERISTICS (Continued)**

U.S EPA Waste Code	Contaminant	Level (mg/L)	Federal Regulated Level	California STLC	TTLc
D037	Pentachlorophenol	_____	100.0	1.7	17
D038	Pyridine	_____	5.0		
D010	Selenium	_____	1.0	1.0	100
D011	Silver	_____	5.0	5	100
D039	Tetrachloroethylene	_____	0.7		
	Thallium	_____		7.0	700
D015	Toxaphene	_____	0.5	0.5	5
D017	2,4,5-TP (Silvex)	_____	1.0	1.0	10
D040	Trichloroethylene	_____	0.5	204	2,040
D041	2,4,5-Trichlorophenol	_____	400.0		
D042	2,4,6-Trichlorophenol	_____	2.0		
	Vanadium	_____		24	2400
D043	Vinyl chloride	_____	0.2		
	Zinc	_____		250	5,000
	PCB	_____		5.0	50

**6.0 TOTAL METALS**

Metals (ppm)	Avg.	Min.	Max.	Metals (ppm)	Avg.	Min.	Max.
Aluminum	_____	_____	_____	Iron	_____	_____	_____
Antimony	_____	_____	_____	Lead	_____	_____	_____
Arsenic	_____	_____	_____	Mercury	_____	_____	_____
Barium	_____	_____	_____	Molybdenum	_____	_____	_____
Beryllium	_____	_____	_____	Nickel	_____	_____	_____
Cadmium	_____	_____	_____	Selenium	_____	_____	_____
Chromium VI	_____	_____	_____	Silver	_____	_____	_____
Chromium III	_____	_____	_____	Thallium	_____	_____	_____
Cobalt	_____	_____	_____	Vanadium	_____	_____	_____
Fluoride	_____	_____	_____	Zinc	_____	_____	_____

**7.0 CHEMICAL COMPOSITION**

Chemical Name	Avg.	Min.	Max.	Circle one:
_____	_____	_____	_____	% PPM PPB
_____	_____	_____	_____	% PPM PPB
_____	_____	_____	_____	% PPM PPB
_____	_____	_____	_____	% PPM PPB
_____	_____	_____	_____	% PPM PPB
_____	_____	_____	_____	% PPM PPB
_____	_____	_____	_____	% PPM PPB
Water	_____	_____	_____	% PPM PPB

**8.0 ADDITIONAL INFORMATION AND COMMENTS**

Attached documentation: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**9.0 GENERATOR CERTIFICATION**

I hereby certify, as an authorized representative of the generator named on Page 1 of this Waste Profile, that the information provided in this and all attached documents is true and correct; reveals any and all known or suspected hazards involving the handling, transportation, treatment, storage, and disposal of this waste; and no willful misrepresentations or omissions have been made. I further certify and warrant that this identification is the result either of an analysis of a representative sample obtained and analyzed in accordance with the sampling and testing procedures specified by the U.S. Environmental Protection Agency or by applying knowledge of the process generating the specific waste being offered.

Generator's Signature \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_

## Instructions for Completing the Investigation-Derived Waste Profile

- 1.0 **Generator Information.** The mailing address of the generator and the site where the waste will be picked up should be indicated. The EPA Identification Number for the site must be provided, unless the generator is a conditionally exempt small quantity generator. Be sure to include the CTO number associated with the IDW being profiled.
- 2.0 **Waste Description.** This section provides a general description of the waste and how it was generated. It also requests regulatory information about the waste that will assist in determining what kind of treatment or disposal is required.
- 2.1 EPA hazardous waste codes are also included in this section. Waste codes are chosen according to whether the waste contains any listed hazardous waste or whether the waste exhibits a hazardous waste characteristic. There is a hierarchy for assigning waste codes which can be reviewed in detail in 40 CFR Part 261 of the federal hazardous waste regulations and 22 CCR Chapter 11 of the California Regulations. Here's a simple explanation:
  - a. If the remediation site is associated with a specific industrial process, first look under the K-code listing in 40 CFR §261.32 or 22 CCR §66261.32 to determine whether any of the generating processes exactly match the activities previously conducted at the site. If so, the waste gets the K-code associated with that industrial process. Then go on to step "d" to assign characteristic codes. If the process is not described in the K-code list, go to step "b." There are very few specific industrial processes from the K list that would result in such IDW at Navy facilities.
  - b. If the former activities at the remediation site do not match any of the industrial processes in the K list, look under the more general F-code listings in 40 CFR §261.31 or 22 CCR §66261.31 to determine if any of the generating processes match the activity and contaminants at the site. If so, the waste gets the appropriate F-code. Then continue to step "d" to assign characteristic codes. If the waste does not meet an F-code listing description, also go to step "d." Some common F-code activities include use of solvents, wood treatment activities, and electroplating operations.
  - c. If the remediation site is associated with the release of an unused commercial product, an out-of-date product, or an off-specification product from a manufacturing process, look under the P-code and U-code listings in 40 CFR §261.33 or 22 CCR §66261.33 for a match to the contaminants found at the site. P-code wastes are acutely toxic, and U-code wastes are listed for chronic toxicity, reactivity, or ignitability. A common activity which results in this type of waste is a pesticide storage area where containers were rinsed or where releases occurred. Don't forget to check the lists for common synonyms of the chemical. The CAS number may also be used to review the list of waste codes. If the waste does not match any of the chemicals in this list, go to step "d."
  - d. This step is for assigning additional codes and for assigning codes to wastes that didn't fall into any of the categories described in steps a, b, or c. This step covers physical properties of the waste rather than the process that generated the waste. These waste characteristics are

described in 40 CFR Part 261, Subpart C and 22 CCR 66261, Article 3. There are four categories of characteristics, known as D-code wastes: ignitable, corrosive, reactive and toxic. A waste may exhibit one or more of these characteristics. The only way to determine whether a waste is regulated as a characteristic waste is to take a sample and analyze it for the characteristic, or to use other analytical data to determine if it exhibits one or more characteristics. Toxicity characteristics are discussed in more detail in Section 5 below. If the waste does not fall into any of the categories listed in steps "a" through "c" and does not exhibit a hazardous characteristic, it is not regulated as hazardous waste, although it may be regulated as designated waste.

In addition to the waste codes assigned under the federal regulations, the State of California uses its own set of waste codes that describe the physical nature of the waste. These waste codes should be identified for each hazardous waste according to the list of California waste codes.

- 2.2 This section of the profile also requests information about the land disposal restrictions (LDR) that are applicable to the waste. LDR subcategories exist for some waste codes and should be indicated if applicable. If the waste meets the definition of a wastewater described in 40 CFR 268.2(f), please indicate that in this section. Wastewater is defined as wastes that contain less than 1 percent by weight total organic carbon (TOC) and less than 1 percent by weight total suspended solids (TSS), with exceptions for some wastes. In addition, 40 CFR Part 268 details the LDR treatment standards that apply to each hazardous waste code. These regulations should be used to identify specific LDR treatment standards for the waste described on the profile.
- 3.0 *Transportation Information.* This section is for completing the proper U.S. Department of Transportation (DOT) shipping name, hazard class, and UN/NA number. In addition, the reportable quantity (RQ) for the waste is shown here. DOT information is available in 49 CFR Part 172, and RQ information is available in 40 CFR Part 302.
- 4.0 *Physical Properties.* Important physical characteristics are described in this section of the profile, including many of the characteristics that will be used for verifying the waste identification when the waste is picked up by PRC's waste management subcontractor.
- 5.0 *Toxicity Characteristics.* This section of the profile deals with the toxicity category of the four characteristic waste categories. It contains a comprehensive listing of chemical constituents that are regulated by EPA and California. Their corresponding D-codes are shown in the list, as is the regulated level for each chemical. This section of the form should be completed even if the waste is listed as a K-code, F-code, P-code, or U-code so that LDR requirements are addressed. It is usually based on an analytical report for the waste. If a sample will be collected for toxicity characteristic analysis, the constituents chosen for analysis should be based on a review of available corresponding environmental data, known activities at the site, and possible management methods for the waste.
- 6.0 *Total Metals.* Information on total metals is usually required for waste streams requiring certain types of treatment. For example, an inorganic sludge that exhibits a toxicity characteristic for cadmium and lead (D006 and D008) may be chemically stabilized to meet LDR treatment standards before it is landfilled. Usually this type of treatment consists of "fixing" the waste in

a concrete-like material. In order to ensure that the required EPA treatment standards will be met, the treatment company needs information on the total quantity of cadmium and lead in the waste so that it can develop the proper "recipe" for the waste and stabilizer.

- 7.0 **Chemical Composition.** All the components of the waste are listed, along with a range of their concentration. It is important that the average concentrations add up to 100 percent, so that all the components are represented. The composition of a typical solvent/waste water stream is shown here.

Chemical Name	Avg.	Min.	Max.	Conc.
Xylol (Dimethylbenzene)	3	2	4	%
Ethyl Acetate	5	4	6	%
Methanol	1	1	2	%
Ethanol	1	1	2	%
Hexone (Methyl isobutyl ketone)	1	1	2	%
Aliphatic Naphtha (carrier)	69	50	70	%
Water	20	10	55	%
Total Composition	100	N/A	N/A	%

- 8.0 **Additional Information and Comments.** This section explains any special conditions or handling required for the waste. In addition, this section should list the supporting documentation attached to the profile to support the waste characterization.
- 9.0 **Generator Certification.** The generator certification should be signed by a Navy representative from the installation where the waste is generated.

**ATTACHMENT 7**

**INCIDENT REPORT FORM AND INVESTIGATION COMMITTEE REPORT  
(Three Sheets)**

## INCIDENT REPORT FORM

1. What type of incident took place? ☐ First Aid ☐ Minor Injury  
☐ Major Injury ☐ Near Miss ☐ Property Damage  
☐ Equipment Damage
2. Date: \_\_\_\_\_ Time \_\_\_\_\_ a.m. p.m. Supervisor: \_\_\_\_\_
3. Name of injured: \_\_\_\_\_ Occupation: \_\_\_\_\_
4. Exactly where did the incident occur? (Describe specific machinery or equipment involved, if applicable)  
\_\_\_\_\_  
\_\_\_\_\_
5. How did the incident take place? (Describe what was being done at the time of the incident)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
6. Nature and extent of injury or damage: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
7. Witnesses? ☐ Yes ☐ No  
Names of witnesses (attach any witness statements to this report) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
8. Describe the training the person received for this task, and when: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
9. Is the person experienced at this task? ☐ Yes ☐ No  
Approximate time in months: \_\_\_\_\_

10. Describe any "UNSAFE ACTS" that contributed to this incident:

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

11. Describe any "UNSAFE CONDITIONS" that contributed to this incident:

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

12. What "BASIC CAUSES" were contributing factors to this incident?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

13. Add any additional information related to this incident: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

14. What do you recommend be done to prevent a reoccurrence of this incident? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Person completing report: \_\_\_\_\_

Print Name                      Signature                      Date

**THIS REPORT MUST BE DELIVERED TO THE URIBE HEALTH AND SAFETY OFFICER WITHIN 24 HOURS OF THE INCIDENT FOR MEDICAL TREATMENT CASES AND WITHIN FIVE DAYS FOR OTHER INCIDENTS.**

## INVESTIGATION COMMITTEE REPORT

1. Date of investigation: \_\_\_\_\_

Investigation committee comments: \_\_\_\_\_  
\_\_\_\_\_

2. Recommendation/Corrective action: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Recommendation/Corrective action to be taken by: \_\_\_\_\_

Target date for completion of recommendation/corrective action: \_\_\_\_\_

### Signatures:

Injured Employee:	_____	_____	_____
	Print Name	Signature	Date

Employee's Supervisor:	_____	_____	_____
	Print Name	Signature	Date

Health and Safety Officer :	_____	_____	_____
	Print Name	Signature	Date

Review Committee Member:	_____	_____	_____
	Print Name	Signature	Date

**ATTACHMENT 8**

**WORKER'S COMPENSATION FORM**

**(One Sheet)**

Every work injury to an employee causing absence for one day or more or which requires medical services other than first aid treatment must be reported within 7 working days after the injury. Failure to report promptly is a misdemeanor punishable by not more than a \$5,000 fine. (Sec. 386-95, H.R.S. NOTIFY THE DIVISION IMMEDIATELY IF INJURY RESULTS IN DEATH.) EVERY QUESTION MUST BE ANSWERED FULLY TO AVOID FURTHER CORRESPONDENCE.

The law requires the employer to furnish the injured employee a copy of this report.

### WC-1 EMPLOYER'S REPORT OF INDUSTRIAL INJURY

CASE NUMBER

#### NOTIFICATION SECTION

(NOTE: DO NOT WRITE IN SHADED BLOCKS)

EMPLOYEE NAME LAST		FIRST	MI	SOC SEC NO		DATE OF BIRTH			SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE	MARITAL STATUS MARRIED <input type="checkbox"/> SINGLE <input type="checkbox"/>	DATE RECEIVED	
						MO / DAY / YR					MO / DAY / YR	
ADDRESS				ADDITIONAL ADDRESS INFORMATION (C/O)				CITY		STATE	ZIP CODE	
PHONE	OCCUPATION	HOW LONG EMPLOYED BY YOU AT THIS OCCUPATION?		YRS EMP'D CODE	DEPARTMENT		PAYROLL COMP CLASS CODE		OCC CODE			
REGISTERED EMPLOYER					DBA							
ADDRESS					CITY				STATE	ZIP CODE		
PHONE	NATURE OF BUSINESS	DATE INJURY/ILLNESS REPORTED		DATE OF INJURY/ILLNESS		PREFAS <input type="checkbox"/> WC-2 <input type="checkbox"/> WC-5		DOL NUMBER		DBA		
		MO / DAY / YR		MO / DAY / YR								

#### DETAIL OF INJURY/ILLNESS

TIME OF INJURY/ILLNESS	TIME OF IN CODE	PLACE OF IN IF DIFFERENT FROM EMPLOYER'S MAILING ADDRESS	CITY	STATE	ON EMPLOYER'S PREMISES <input type="checkbox"/> YES <input type="checkbox"/> NO	SIC	OWNERSHIP CODE
HOW DID THIS ACCIDENT OCCUR? (Please describe fully the events that resulted in injury or occupational disease. Tell what happened. Please use separate sheet if necessary.)				SOURCE OF INJURY		ACCIDENT TYPE	

WHAT WAS EMPLOYEE DOING WHEN INJURED? (Please be specific. Identify tools, equipment or material the employee was using.)

TASK	ACTIVITY	ACCIDENT FACTOR
------	----------	-----------------

AOS

OBJECT OR SUBSTANCE THAT DIRECTLY INJURED EMPLOYEE (e.g. the machine employee struck against or struck him, the vapor or poison inhaled or swallowed, the chemical that irritated his skin, in case of strains, the thing he was lifting, pulling, etc.)

DESCRIBE IN DETAIL THE NATURE OF THE INJURY, ILLNESS AND PART OF THE BODY AFFECTED

YES	NO	NATURE OF INJURY	PART OF BODY
DISFIGUREMENT <input type="checkbox"/>	<input type="checkbox"/>		
BURNS <input type="checkbox"/>	<input type="checkbox"/>		

#### TIME LOST INFORMATION

DATE DISABILITY BEGAN	WAS EMPLOYEE FURNISHED MEALS OR LODGING? <input type="checkbox"/> YES <input type="checkbox"/> NO	AVG WKLY WAGE	IF EMPLOYEE IS BACK TO WORK GIVE DATE	WAS EMPLOYEE PAID IN FULL FOR DAY OF INJURY/ILLNESS? <input type="checkbox"/> YES <input type="checkbox"/> NO	IF EMPLOYEE DIED GIVE DATE	HOURLY WAGE	MONTHLY SALARY	HRS WLED PER WK	WEIGHING FACTOR
MO / DAY / YR			MO / DAY / YR		MO / DAY / YR				

GIVE NAME AND ADDRESS OF SURVIVORS ON BACK

#### TREATMENT

OBTAIN NAME OF TREATING PHYSICIAN FROM EMPLOYEE

NAME OF PHYSICIAN	ADDRESS	PHYSICIAN I.D. CODE
NAME OF HOSPITAL (IF HOSPITALIZED)	ADDRESS	

#### INSURANCE

CARRIER I.D.			
NAME OF WC INSURANCE CARRIER	NAME OF ADJUSTING COMPANY	IF LIABILITY DENIED WHY?	IS LIABILITY DENIED? <input type="checkbox"/> YES <input type="checkbox"/> NO
NO	POLICY PERIOD	ADJUSTER NAME	CARR CASE NO
		ADJUSTER I.D.	MEDICAL DEDUCTIBLE

#### SIGNATURE

SIGNATURE	TITLE	DATE MO / DAY / YR
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